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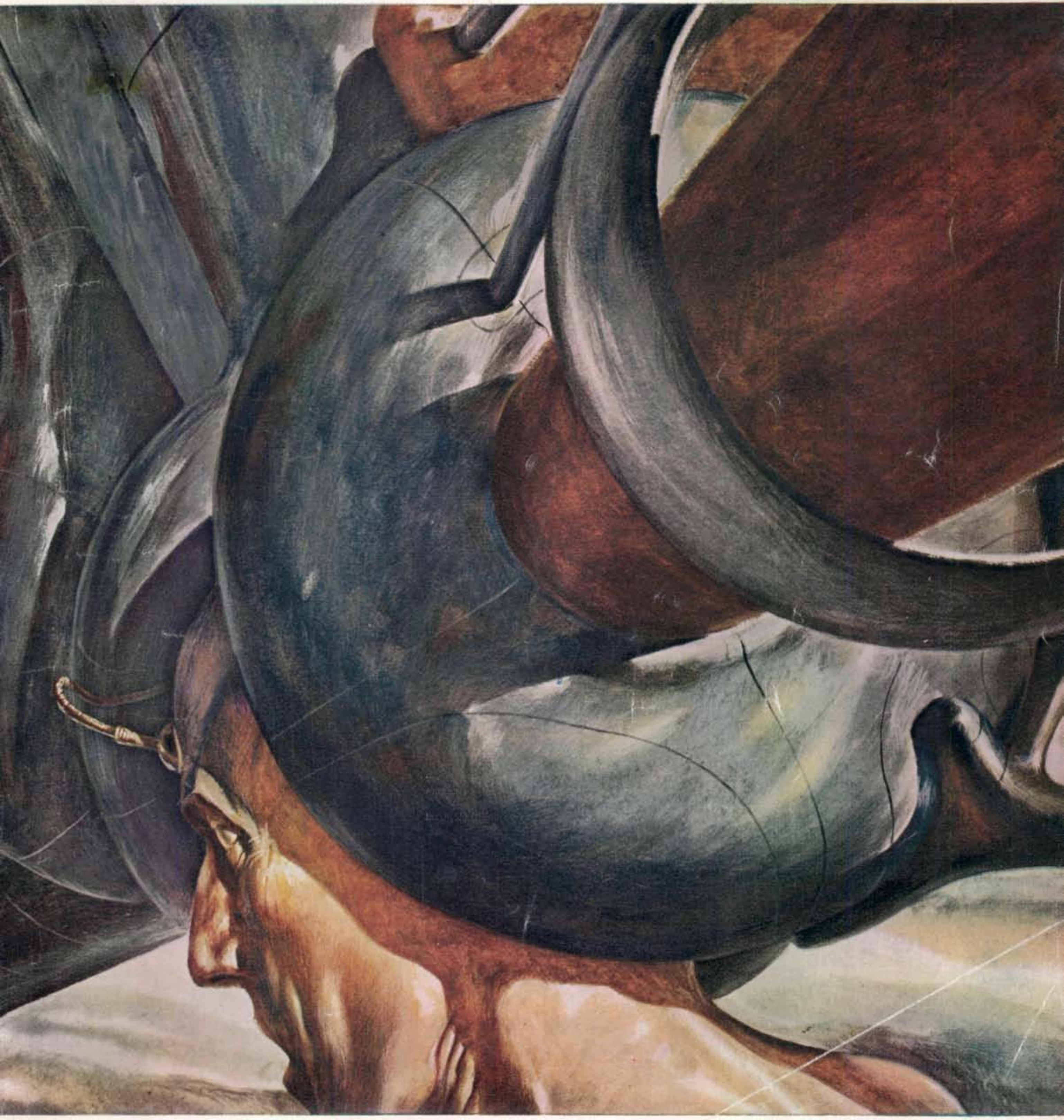

TAKE THE REASON PRISONER | BY JOHN J. McGUIRE

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An open-minded attitude toward what's possible and what's impossible is one of the mainstays of our research effort.

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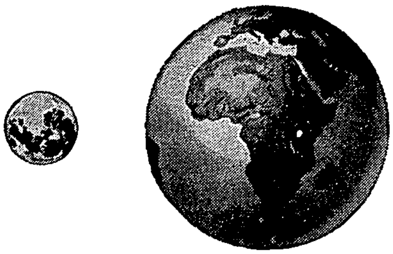

NEW HOPE FOR UNDER-DEVELOPED NATIONS RESULTING FROM BASIC SPACE RESEARCH

Lunar and space missions such as Project Apollo seldom seem, in their far-out glamour role, to be closely related to that great fundamental... mankind. Yet one single aspect of the Apollo program—fuel cells—holds a vast amount of hope. Especially for under-developed nations.

Often referred to as "continuous batteries," fuel cells convert chemical energy directly to electrical. They are the newest power sources to emerge from scientific research into the realm of practical engines. The specific cell system aboard Apollo will be a Hydrox® unit, reacting hydrogen and oxygen, and is the result of research at Leesona Moos Laboratories, one of the first in America to undertake studies on fuel cells. Hydrox will supply electrical power for vehicle control, communications, and numerous other power needs aboard this lunar mission. Marking the first such use of these new power sources, the Hydrox installation will inaugurate a new age in the generation of electrical power. Final engineering and manufacture of the units for Project Apollo will be carried out by Pratt & Whitney Division of United Aircraft, under license from Leesona Corporation.

But space missions are only the first part of the story. At the same point in time that Leesona Moos began studies of Hydrox fuel cells, a concomitant project was undertaken to develop an even more advanced system... a cell using air as oxidant and inexpensive hydrocarbons or their derivatives as fuels. These hydrocarbon-air (Carbox®) and mixed-gas/air (Aminox™) developments of Leesona Moos do not require reactants of high purity, and are very flexible from a logistics point of view. Low cost and readily available fuels are used, and the universal oxidizer—air—supplies the other portion of the reaction mix. Because the fuel cell is an extremely efficient engine—efficiencies of up to 70% are attainable, vs. 30% for a conventional diesel—the result is an exciting new means of generating electrical power at low operating expenditure. Pratt & Whitney Aircraft in the United States, and Energy Conversion Ltd.,* of England, are carrying out further developmental engineering on these systems under license from the Leesona Corporation.

These new Leesona power sources, of high efficiency and low fuel costs, can readily be seen to provide the world with an entirely new type of electric generator. Fuels of the hydrocarbon variety are fairly abundant throughout the world. The fuel cell, though scientifically sophisticated, is neither unwieldy nor complex in its operation, and requires little maintenance. Units with power levels from those required for a one-family dwelling up to communal or industrial ground-power stations have been projected in Leesona Moos studies, and found feasible.

The impact Carbox and Aminox can have on the emerging countries is readily understandable. The development of a nation can almost be measured by its ability to produce and consume electrical power. In this mechanized world, virtually all industry waits on the availability of electricity. If an emergent economy must hold off its development until completion of large-scale hydroelectric projects, a distinct problem of time and expenditures arises. If, on the other hand, the nation had access to Carbox and Aminox type fuel cell systems, which could be tailored to the need and would operate on locally available fuels, the basic first step toward an industrialized economy and higher living standards would be achieved.

Leesona believes its efforts, plus the great additive capabilities of our United States and international partners, will soon result in working installations of the Carbox and Aminox systems to advance the standards of all mankind. Meanwhile, the sibling Hydrox system supplies power for a moon voyage. And research continues.

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SCIENCE FACT ⇝ SCIENCE FICTION

SCIENCE FACT

SEAGOING "SPACE" SHIPS
Charles Layng 8

SHORT NOVEL

TAKE THE REASON PRISONER
John J. McGuire 17

SHORT STORIES

PLEASANT JOURNEY
Richard F. Thieme 42
INTERVIEW
Frank A. Javor 45
PROBLEM OF COMMAND
Christopher Anvil 74

SERIAL

WHERE I WASN'T GOING (Conclusion)
Walt and Leigh Richmond 48

READERS' DEPARTMENTS

Brass Tacks 4
The Editor's Page 7
In Times to Come 47
The Analytical Laboratory 80
The Reference Library
P. Schuyler Miller 87

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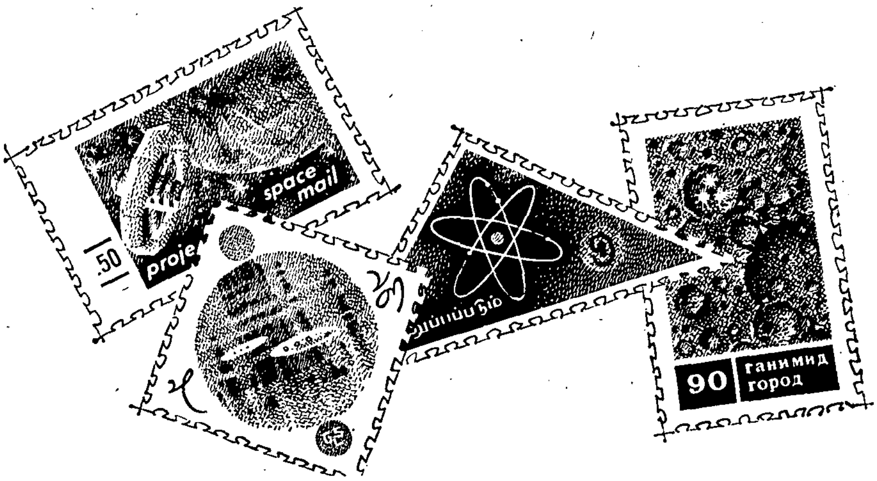

BRASS TACKS

Dear Mr. Campbell:

Very interesting editorial in your April number. One or two little points:

Have you forgotten the Ashanti and Kanu civilizations in West Africa? I think they were based on iron. Primitive and short-lived as they were, they seem to disprove some of what you were saying. They have survived to the extent that the modern inhabitants of pure Negro stock in S. Ghana, S. Nigeria, et cetera, are more progressive than the Hausas who live farther north, who have been affected both genetically and culturally by Arabs and Berbers. Here, at least, the "sociological mechanism that renders civilization impossible" broke down.

In a way, this exception proves the rule, or rather bears out much of what you said in your editorial. These West Africans are the most Negro of all Africans. They have the darkest skins, the purest Negro features and languages that bear no relation to others or to each other. They are just about as far away from Egyptian influence as you can get, in Africa.

On the other hand, the Bantus, who occupy most of the rest of "black" Africa, have paler skins, sometimes even Hamitic features, and they all speak a family of closely related languages. I have read that the Bantu languages are *linguistically* much more advanced—simpler, more logical and consistent, et cetera—than the West African languages, and that they are either descended from or deeply influenced by some ancient Hamitic language. Yet it is the Bantus who seem to suffer the worst from your "sociological mechanism."

In climate, too, the anomaly remains: the West Africans live in a "white man's hell" so terrible that not even the British Army would keep its personnel there for longer than two years. Many of the Bantus live in pleasant, bracing climates.

My guess is that, when the sociological mechanism that has prevented the other Africans from becoming civilized is discovered, it will be found to have something to do with the witch doctors, and possibly with native drums. What is the cause I cannot say. Obviously the relation between the factors will be complicated. But do not underestimate the drums.

The sociological mechanism is far from restricted to Africa. Perhaps the most astonishing case is that of the islands of primitivism in Southeast Asia. I myself saw a little of the Gonds, a tribe living in a pocket lying to the West of Ranchi, some two hundred miles West-North-West of Calcutta. According to earlier writers, they were a tribe of near-pygmies living in absolute savage primitiveness. The ones I saw had recently acquired some features of normal Indian culture. They were good farmers and had adopted a form of Hinduism, though the Indians who were with me told me this was only skin-deep. They were far from being pygmies. Evidently, civilization agreed with them, for they had

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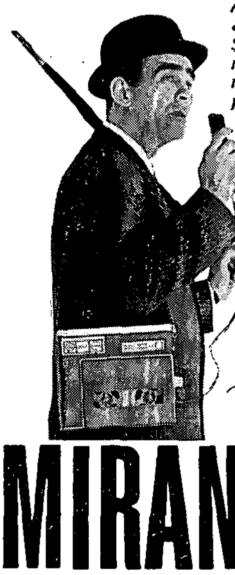

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fine physiques and were almost European in size—far bigger than the average Indian. Packed full of vitamins, they were. But they were different: their skin color was absolute black—lamp black. I have never seen an African without a shade of chocolate in his skin.

Coming to the point: While I was there, they had a temple feast lasting two weeks. During the whole of the time, without break, they played drums. My fellow officers—Europeans—became nervous wrecks, as only to be expected. Not only they, but also the Indians in the unit, including even a havildar-clerk from nearby Ranchi. The whole of Gond civilization including the drums was alien to them. By the end of the two weeks, they were all prone. I say "they," because I wasn't. In the daytime the drums stimulated me. At night, they soothed me to sleep. For two weeks, I was the key man in the unit.

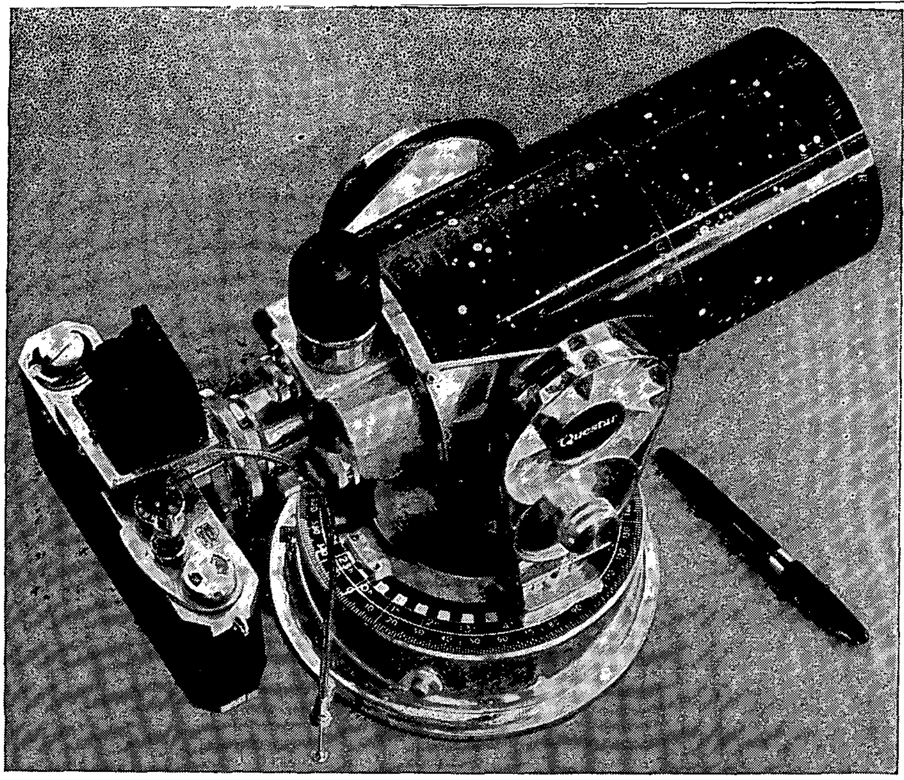
Even today, I know that complicated drum rhythms make me completely happy. If I could listen to them all the time, I would never want to change anything, never know ambition—just roll on from day to day. Isn't that happiness the inhibitor of civilization? I bet any witch doctor worthy of the name knows this for a fact and sees that his "patients" get plenty of rhythm to last them all their lives.

R. MILTON,

Kulosaarenpuistotie 38-1
Helsinki, Finland

Trouble with editorials is they have to be highly condensed; there were several Negro empires in various parts of Negro Africa—but there's an important catch. I can levitate, if by "levitate" you mean "remain suspended in midair for a period of time," and don't stipulate the time. For a millisecond, I can! Occasional extremely powerful individuals arise who forge an empire . . . which disintegrates immediately afterward because the organizational abilities of the culture can't support it. Examples are Genghis Khan's empire, which his Mongol nomads couldn't maintain. Alexander's

Continued on page 92



May we tell you about the first wholly satisfactory camera body for use with Questar? It is a special Questar-modified Nikon F, obtainable only from us.

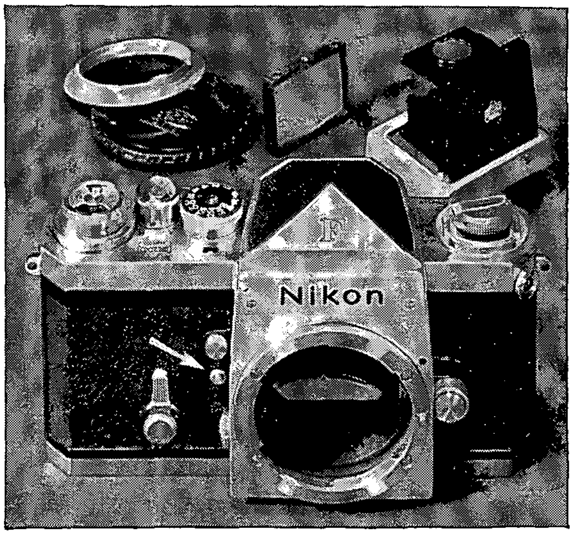
The problem of taking high resolution pictures through the superfine high-power Questar telescope on 35-mm. film can be reduced to three principal factors: lack of vibration, sharp focus, and correctly thin negatives. The last critical factor, exposure time, can now be measured at the image itself with a CdS lightmeter at Questar's 40x eyepiece.

Vibration during exposure is our chief enemy. Images of perfect optics are formed by an infinite number of overlapping perfect diffraction images. The tiny round dot of Questar's diffraction image, the Airy disk, is only about .0002 inch across. When a reflex mirror slams up a fraction of a second before the roller-blind curtain slit sweeps across the film, a vibration is usually set up of some .001 inch amplitude. Pictures taken before these oscillations are damped out give a fuzzy picture when enlarged. Standard Nikon F bodies can lock the mirror up, allowing the featherweight ball-bearing titanium foil focal plane shutter to work alone, with a visible shock of only the dot's width, most of which is post facto effect, after exposure. This gives us negatives so sharp we could not tell them from those taken by waving a black card. But being blind between exposures is most annoying. The arrow points to the Questar modification, a tiny button which releases the mirror any time after you have checked everything and are ready to expose. Price of Questar-modified standard Nikon F body, as shown, is $259.60 with bakelite cap. (We regret that we cannot have your own Nikon body modified.) Cable release, $3.95. Photomic finder, $99.50. 50-mm. f/2 Auto-Nikkor Lens, $90.00. Auto-Nikkor f/1.4 50-mm. Lens, $155.00.

Sharp focus has always been a problem with long-focus telescopes. With camera close-coupled, Questar works at f/16 at 56 inches. With 2-inch extension tubes to reduce vignetting, f/18 at 64 inches. These focal ratios give such dim views that the image is hard to see. The standard split-prism rangefinder works only with fast, low f numbers. But Nikon's Type C interchangeable groundglass, with clear center and hairline cross, at $17.50, gives brilliant images with a mark to keep the eye from accommodating in front or behind the focal plane. At right is the waist level finder, $22.50, which permits best view of the Type C cross with eye up close to its lens.

The new cadmium sulphide light meters, with their small openings, have been used by Questar owners to apply directly to visual eyepiece or camera views of the image, to get an actual reading of what the image unit brightness is regardless of magnification of all nature's variables. We have little data on this at present. Recalibration is necessary, but we hear it is simple. At long last we can completely ignore the variables of nature, due to geographical location, sun's intensity, water vapor, time of year and day—all the guesswork which makes exposure tables impossible. The able photographer may locate the subject with Questar's 40-80x eyepiece, then pop the CdS cell over exit pupil of ocular and take a reading to determine speed.

At upper left is a new, more compact ring adapter, $10.00, to secure Nikon F bodies to Questar's $23.50 basic camera coupling outfit, a multi-purpose device described in detail on page 26 of the Questar booklet. Questars still cost only $995, or $1100 with quartz mirror for best thermal stability. Each is a gem of superfine optics, whose sharpness might eventually be equalled, but can never be surpassed.



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EDITORIAL BY JOHN W. CAMPBELL

ufo

UNIDENITFIED FLYING OBSERVATIONS

Recently I read a fascinating paper discussing the nature of "ball lightning." The paper was writen in 1938, before the discovery of plasma jets, plasmoids, and before ball lightning was "respectable." The author was a scientist with the United States Weather Bureau, and he was making a very sincere and careful effort to find the explanation of the observations reported to him. He had collected over two hundred separate observations, from people of all types—housewives, professional scientists, hunters, bankers, farmers—and had analyzed all the reports as carefully and honestly as he could.

He suffered under one serious handicap—not what he didn't know, but something he did know: he knew-for-sure that the phenomena being reported were not, and could not possibly be, anything of a lightning nature. Nothing of electric high-energy-concentration.

Starting with that knowing-for-sure what it wasn't, he was, necessarily, forced into the position of explaining away what was actually happening!

His explanations were extremely ingenious and frequently highly imaginative. One of the best he came up with was the Luminous Owl Effect. This is the explanation of ball-lightning observed at night. The Luminous Owl effect involves an owl that has spent the day in a hollow tree that happens to be heavily infested with luminous bacteria, so that when it flies out at night, it appears as a glowing ball bouncing around soundlessly through the air.

There is, hidden under all this thinking, a postulate that he himself was not conscious of: "All these observers were incompetent; the proof of their incompetence is that they report a phenomenon which I know-for-sure cannot exist."

The major difficulty in this whole class of phenomena is that the observed event is of short duration, cannot be predicted beforehand, cannot be arranged for ahead of time, and concerns something that the nonobserver is sure does not and can not occur.

Currently, one of the most widely discussed examples of this is the phenomenon of the U.F.O.'s—"Unidentified Flying Objects" technically, but I think that "Unidentified Flying Observations" would be a better term—because therein is the difficulty. The observations are necessarily accidental, very brief, unexpected and hence difficult to interpret. The observations have to be made on the fly! The things may not be "objects," for all we know; a high-intensity energy field of almost any nature will produce a local ionization of the air and can be quite luminous—luminous enough to be clearly visible in full daylight as well as at night. If some such phenomenon were involved, there would be no material "object" present.

And one of the most commonly heard objections on the part of nonobservers is, in essence, "If there are so many of these 'flying saucers' around, how come nobody's gotten a picture of one?"

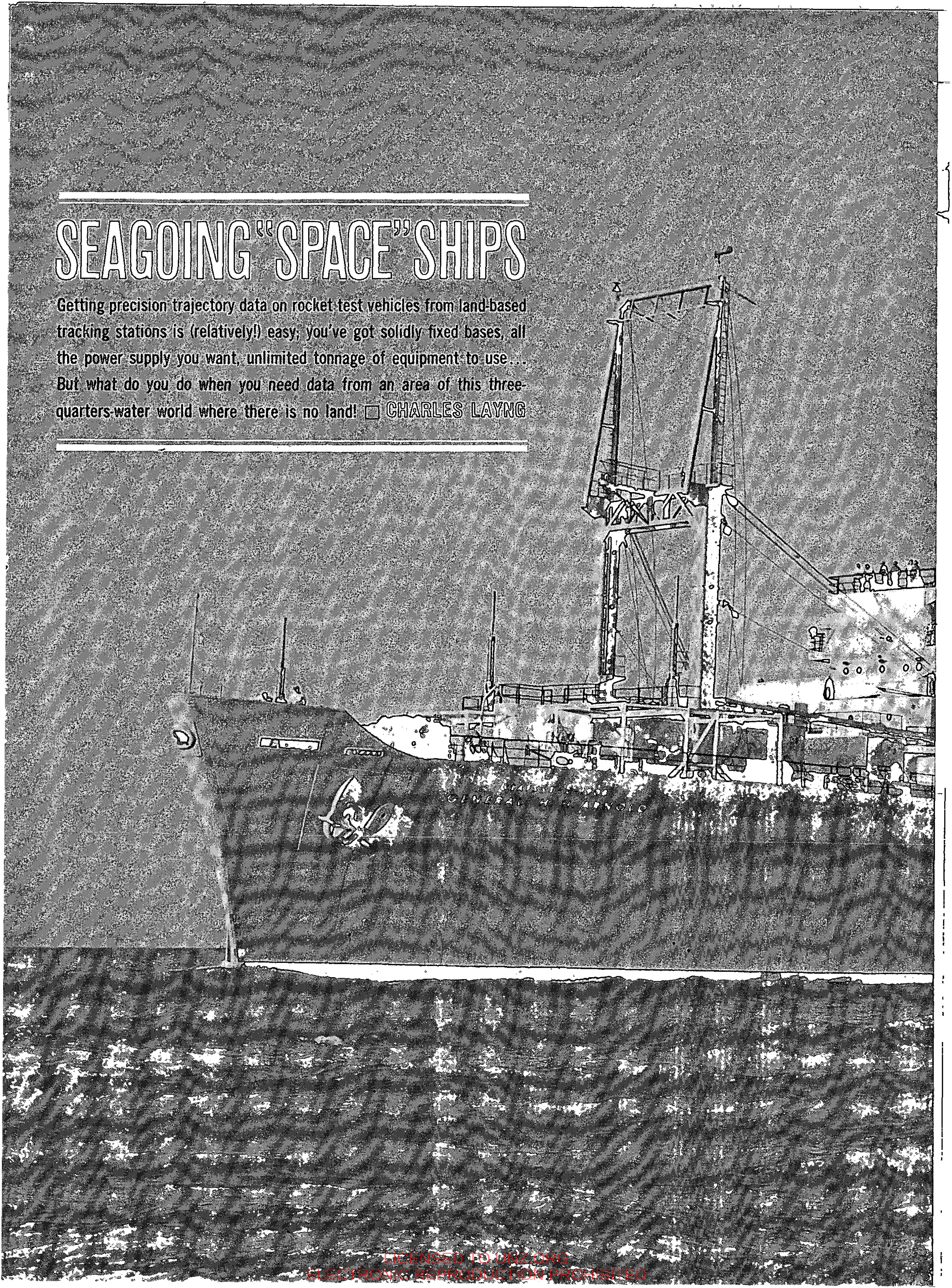
Just for the fun of it, I did a little experimental investigation myself. I can't go out looking for flying saucers to photograph—but I can try something in some ways equivalent. I can try photographing what we'll call for the sake of discussion, "flying crosses." The mysterious flying crosses that have been reported by many people, we'll say, and consider we're investigating the problem about 1893 instead of 1963.

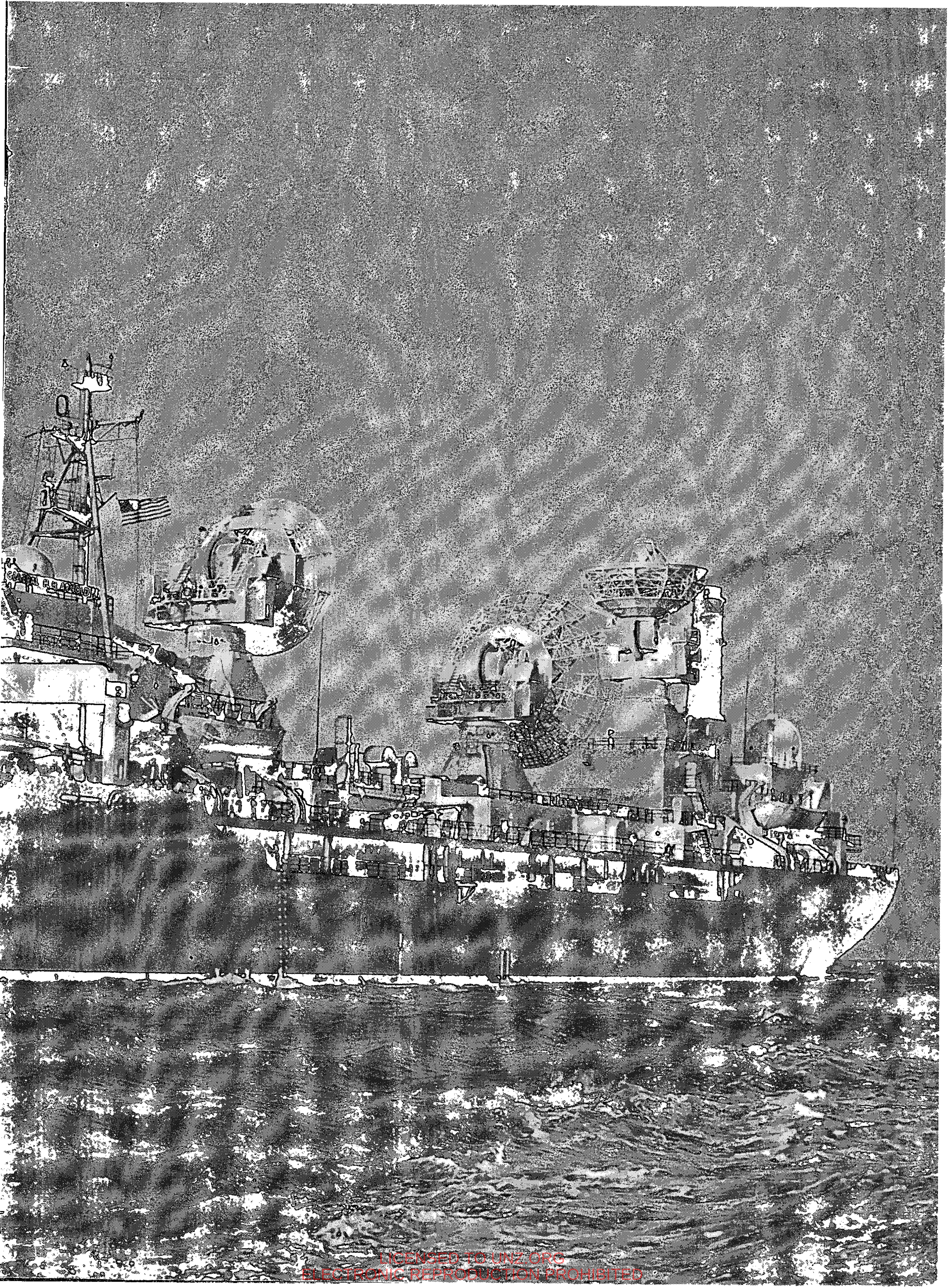
The "mysterious flying crosses," of course, are modern commercial airplanes—transports and private light

continued on page 82

SEAGOING "SPACE" SHIPS

Getting precision trajectory data on rocket test vehicles from land-based tracking stations is (relatively!) easy; you've got solidly fixed bases, all the power supply you want, unlimited tonnage of equipment to use... But what do you do when you *need* data from an area of this three-quarters-water world where there is no land! ☐ CHARLES LAYNG





The *General H. H. Arnold* and the *General Hoyt S. Vanderberg* are ships—but such ships as these have never been seen before upon the seven seas. Actually, they are gigantic floating sensing and computing machines of almost incredible complexity. The two ships, recently commissioned at Cape Canaveral, are missile-tracking ships, which have now taken up their stations in the South Atlantic-Indian Ocean area.

Major General Leighton I. Davis, head of the Air Force Missile Test Center, under whose command the ships will operate, calls them: "miracles of instrumentation, representing the ultimate in missile-tracking equipment."

When the ship's tracking system is trained on a missile in flight, it can collect between 10- and 20-million bits of information from the flying object in two to three minutes. When fed to the computers in the hold, these machines can be stepped up to process 800-million items of information a minute.

Only a decade or so ago, such ships could not even have been imagined—much less actually built. Today, these floating platforms, containing some of the most sophisticated and complex electronic equipment ever designed, are greatly extending the instrumentation facilities of the Atlantic Missile Range.

Lieutenant General Bernard A. Schriever, of the Air Force Systems Command has called this Range "an instrumented shooting gallery" and that's an apt term for it. Instrumentation is the core of missile tests. More than twenty-five hundred test firings were required to develop such a relatively simple rocket as the German V-2, whereas only fifty tests were needed to develop the infinitely more complex Thor—the huge test reduction being the result of better instrumentation.

The two missile-tracking ships serve a vital instrumentation need. In addition to the vast instrumentation complex at Cape Canaveral, the first five thousand miles of the Atlantic Missile Range are covered by ten tracking stations situated on islands in the Caribbean and the Atlantic. Beyond Ascension Island, though, there are no island-tracking stations and modern missiles are planned for far longer flights than five thousand miles. The two ships were built to carry out the tracking function far beyond where it had previously ended at Ascension Island.

Tremendous new problems were, of course, created by the use of ships as tracking stations. The ship's position with relation to Cape Canaveral, for instance, had to be determined within a tolerance of only a few yards if the tracking data was to be of any value. The roll, pitch and yaw of a ship impose problems that didn't bother the designers of the island-tracking stations.

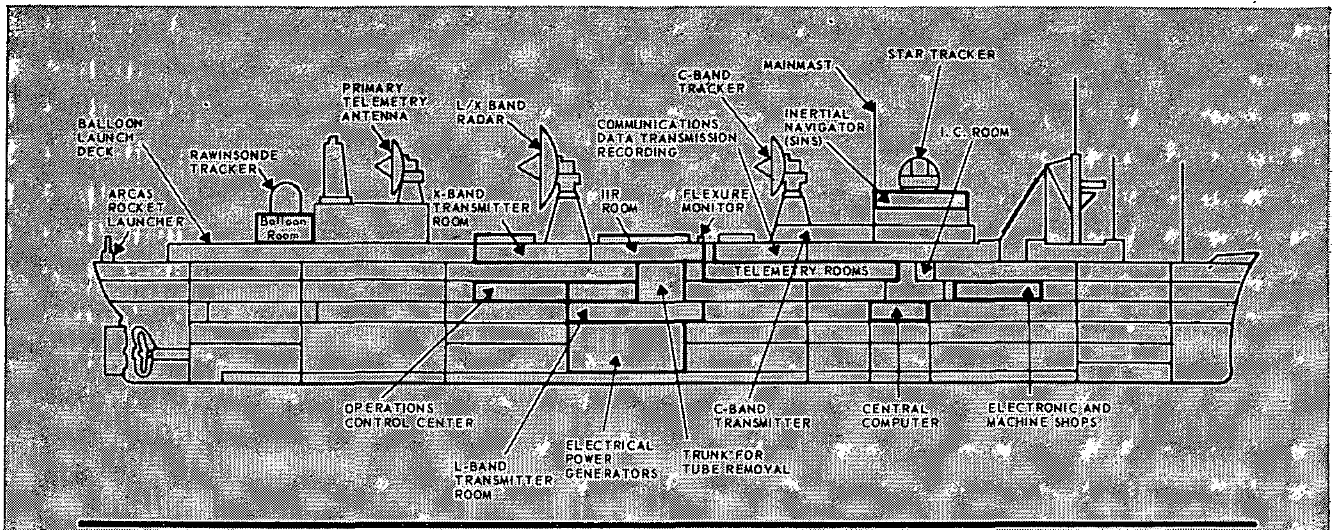
The accurate stabilization system that had to be set up, along with the navigation subsystem that supplies accurate heading and velocity information, are triumphs of ingenuity and engineering skill. The weather stations on these ships are by far the most sophisticated to be found anywhere in the sector of the world where they'll be stationed. They can sample the atmosphere from sea level to nearly fifty miles up—as high as two hundred fifty thousand feet.

The primary purpose of these ships is described by General Schriever as: First, providing detailed radar observations of nose cones. Second, making ballistic missile trajectory and impact measurements, including the reception and recording of telemetry data. Third, give support to space missions.

The conversion of these ships from mothballed troop transports to the large and completely equipped missile-tracking vessels represents the trickiest conversion task ever handled by a commercial shipyard in New York Harbor. The complexity of the task may be imagined when it's realized that more than five thousand sheets of engineering specifications had been written for each vessel. More than fifteen hundred men were employed at the peak period of reconstruction at the Bethlehem Steel Company's Brooklyn shipyard. Final drydocking, painting and bottom cleaning were handled at the Hoboken shipyard of the same company.

The measurements of the two ships are the same, 502 feet long, a 71½ foot beam, 14,300-ton rating, and they have a sea speed of more than seventeen knots. They are manned by what amounts to two crews, a hundred men to operate the ship and another hundred to handle the ship's instrumentation. Each ship has been outfitted with six hundred thirty-six compartments, including staterooms, storerooms, offices, a hospital, dining and recreattional areas, including a theater, laundries, lounges, lockers, galleys, pantries. Every care is taken to see that there are ample facilities to keep both crews content and satisfied, for, after taking station far from land in the Indian Ocean or the South Atlantic, they do not put into port very frequently. Like lightships, their job is to be on station—not useless in port.

The profile of the ships is completely


STAR TRACKER
MAINMAST
C-BAND TRACKER
PRIMARY TELEMETRY ANTENNA
L/X BAND RADAR
COMMUNICATIONS DATA TRANSMISSION RECORDING
INERTIAL NAVIGATOR (SINS)
I. C. ROOM
BALLOON LAUNCH DECK
RAWINSONDE TRACKER
ARCAS ROCKET LAUNCHER
Balloon Room
X-BAND TRANSMITTER ROOM
IIR ROOM
FLEXURE MONITOR
TELEMETRY ROOMS
OPERATIONS CONTROL CENTER
C-BAND TRANSMITTER
CENTRAL COMPUTER
ELECTRONIC AND MACHINE SHOPS
ELECTRICAL POWER GENERATORS
TRUNK FOR TUBE REMOVAL
L-BAND TRANSMITTER ROOM

ARIS 1 & 2

SHIPS CHARACTERISTICS:

		Displacement	
		Full Load:	*14,300 tons*
Type:	*Converted C4-S-A1 Troopship*	*Light Ship:*	*10,500 tons*
		Sustained Sea Speed:	*17.3 knots (non-tracking)*
Length:	*520 feet*	*Fuel Oil Capacity:*	*Excess of 2500 tons*
Beam:	*72 feet*	*Cruise Range:*	*Excess of 5000 nm*
Draft:	*25 feet*	*Work and Living Areas:*	*Fully air conditioned*

unlike that of any other ship. Visible on the superstructures are three 30- and 40-foot-wide radar dishes mounted on top of massive steel towers, two domelike tracking structures, a multi-tiered forward bridge house, with a weather station and a rocket launcher aft. Workers at the Sperry Gyroscope Company, the prime contractor and systems management organization, and Gibbs & Cox, the design agents for the conversion, have nicknamed them "floating Ascension Islands." This name has a peculiar history; for many years after Ascension Island came under British rule, it was officially carried on the records as "His Majesty's Ship Ascension" and was governed by a navy captain, with a full crew of British naval personnel.

Converting a 1944 troop transport into a space-age ship required an immense amount of design and rebuilding. The biggest phase was the installation of electronic equipment and connecting cables. More than fourteen hundred cables had to be placed within the electronic spaces alone, while another sixteen hundred had to be installed to run between the spaces to link them to the master control console.

Another vital and complex task was the air-conditioning, de-humdifying and insulation of spaces containing the extraordinarily delicate electric computing devices. Vast quantities of pipe had to be installed, of which forty thousand feet had to be specially insulated. The spaces that housed the Univac military real-time computer, the central data conversion equipment, the radar systems, the telemetry system and, finally, the operations control console, required the most refined air-conditioning, sound-proofing and de-humidifying arrangements to insure against any miscalculation or possible malfunctioning. To accomplish this, Bethlehem installed two 300-ton air-conditioning units and 300,000 square feet of acoustical and thermal insulation and lining.

The residential electrical power needs of a city of eighteen thousand could be supplied by the three steam turbine-driven generators that supply most of the power for the ships' non-propulsive and electronic equipment. These produce a total of six thousand kilowatts. The ships are propelled by steam turbines developing 9,000 h.p. These are the only ships in the world with *two* engine rooms—one for non-propulsive power and one for driving the ship.

Each of the two main radar reflectors and the telemetry antenna are supported by tremendous foundations, whose supports run through from the upper decks to the keel and weigh 170,000 pounds apiece. These are far and away the largest mobile units ever built. Each pedestal combines the vitally essential pin-point tracking accuracy with exceptional stiffness. Rigidity was a major requirement in the design, since the rolling, pitching yawing deck of a ship at sea demands extraordinary stiffness of the radar antenna supports if accurate tracking performance is to be achieved. These six American Machine & Foundry pedestals each have temperature-controlled pre-load for the main support bearing, a feature that insures smooth operation, low friction at all ambient temperatures, and maintenance-free performance.

The elevation coverage of the radar dishes extends from minus 15 degrees to plus 95 degrees and they have an azimuth coverage of 305 degrees. Their maximum velocities are, in elevation, 25 degrees per second, in azimuth, 35 degrees per second. Their durability — and reliability — is indicated by the fact that they can maintain full operating performance in winds up to 55 miles per hour; they can stand winds of up to 115 miles per hour unharmed if in a stowed position, and they'll survive icing up to 4.5 pounds per square foot. They'll also operate accurately in temperatures from 40 degrees below zero, Fahrenheit, to 160 degrees above zero.

One of the most difficult of the actual shipbuilding operations was the setting of the monstrous antenna mounts—three to each vessel. An 89-ton, 22-foot high antenna mount is not exactly a convenient object to handle. The experts abroad a U.S. Army derrick barge that was recruited for the purpose did a job of extremely adept derrick control and handling. These mounts had to be movable, despite their size and mass. They turn on giant ball bearings as the radars track a flying object. Such a weight above deck naturally rendered the ship's balance somewhat "cockeyed," to put it mildly, so, to improve the stability of the ship under all possible weather conditions, four hundred ten tons extra were added to the existing ship ballast.

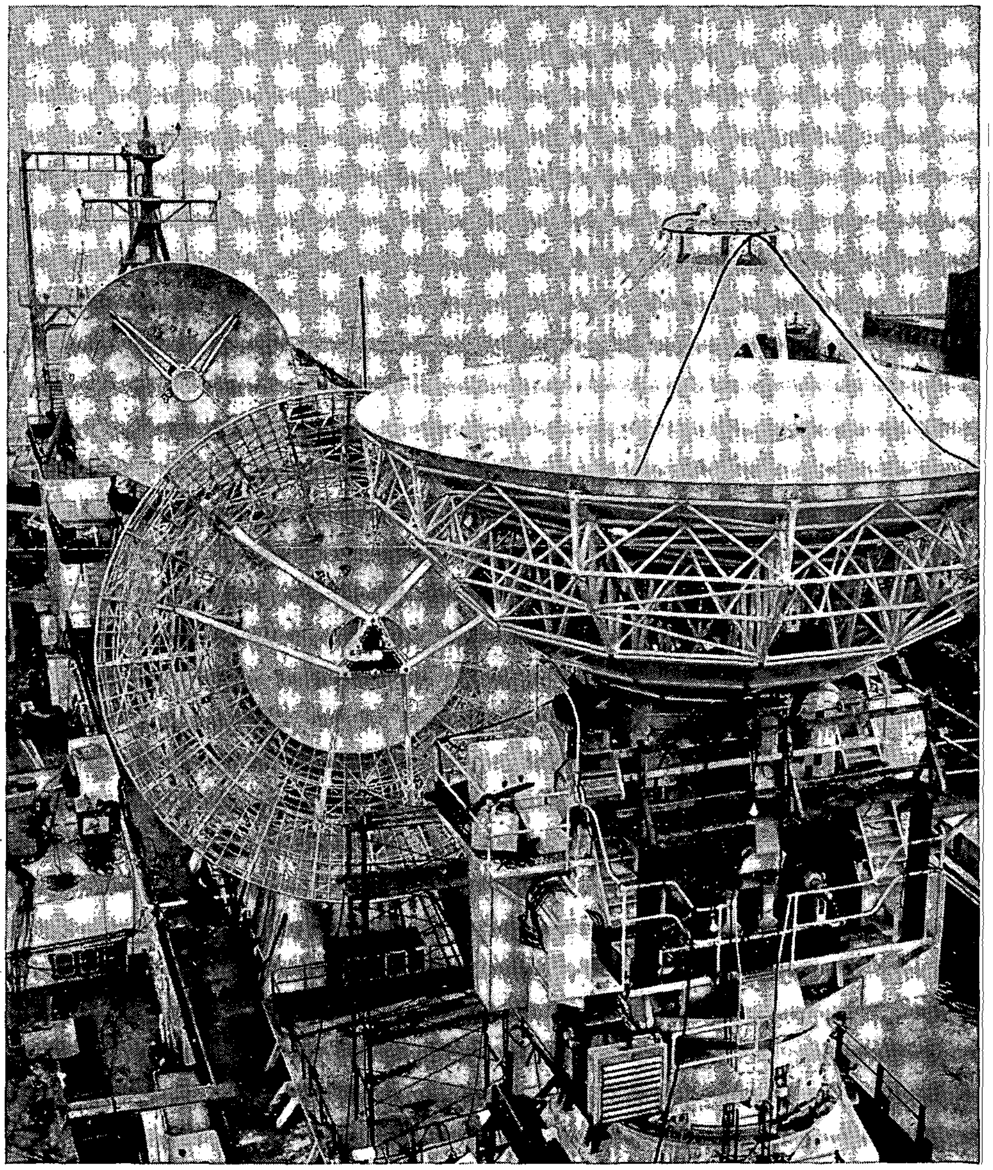
Slightly more than 425,000 feet of cable had to be installed on each ship. Some five hundred forty "black boxes," containing the relays and electronic devices, were also installed, controlling the ship's radar, data handling, telemetry, meteorological, timing and communications equipment.

Some portions of the superstructure were completely removed. The old stack had to be removed and the entire system relocated farther aft so that there would be no possibility of the fuel gases interfering with the telemetry antenna. All of the ships' masts are completely new and a new house was added atop the pilot house. A complete weather station, with a rawinsonde tracker, was installed aft. This includes a balloon launch deck and a hangar for the weather balloons, as well as an Arcas rocket launcher on the extreme stern.

The ITT Federal Laboratories, charged with the major instrumentation projects, produced mobile tracking stations that will not only increase the Atlantic Missile Range to some ten thousand miles—extending into the Indian Ocean—but will also match the capabilities of the most highly developed land-tracking stations. The heart of the entire tracking system is a high performance telemetry system that will acquire, track, receive, record and retransmit the performance data of space-vehicle flights. Of particular importance is the fact that the data in the impact area will be thoroughly received and digested for the first time on a complete scale. A 30-foot parabolic antenna, designed to operate over a wide range of telemetry frequencies, is the key to this system.

One of the most powerful radio communications systems ever engineered for shipboard use is installed on these ships. Through high-power transmitters and receivers, complete voice, teleprinter and high-speed data communications are made available over a wide range of frequencies. A newly designed and uniquely compact high power antenna known as Helicyl materially aids the communication systems.

The 30-foot parabolic reflecting antenna and its accompanying C-band radar set form the primary tracking device. In addition, a dual frequency L and X-band antenna forty feet in diameter gathers signature information while slaved to the C-band antenna position. The 30-foot telemetry dish tracks passively in angle and, if it starts tracking before the C-band radar



acquires the missile, it will supply the master designation angles.

While equipped to handle all sorts of emergency procedures, the normal general operation procedure of these ships is as follows: The ships sail prescribed courses in the vicinity of the expected impact point, measuring the position accurately with reference to surveyed sonar beams. As the missile leaves the launching pad, ten thousand miles away, the communications subsystem supplies the ships with post-burnout parameters from Cape Canaveral via teletype.

To determine an acquisition point well in advance of the missile's arrival, a UNIVAC 1206 computer in the ship's hold integrates the equations of motion of the missile faster than real time, to determine exactly where this point will be. Using measured values of latitude and longitude from the Ship's Inertial Navigational System (SINS) the result becomes a continually corrected stable acquisition point with reference to the ship. SINS also supplies the heading, pitch and roll through the ship's Central Data Conversion Equipment (CDCE). The computer then combines this with the acquisition point to produce designation orders in deck co-ordinates at a rate of ten samples per second. CDCE then converts the digtial designation orders to synchro voltages for correct positioning of the antennas. Whichever tracker first acquires the actual signals from the missile itself is designated as master by the designate controller and the other antennas are slaved to this master through CDCE with corrections for the ship's flexures. In this manner, the completely inconstant and unpredictable ship's motions are phased out and the entire system becomes, in a sense, as fixed and stable as an island-tracking station, except that continued corrections for flexures must be made.

ARIS ANTENNAS Three radar and telemetry antennas cut an unusual shipboard figure on the U.S. Air Force's new Advanced Range Instrumentation Ships. In the foreground is the 30-foot telemetry antenna, part of the telemetry subsystem which was designed and developed by the ITT Federal Laboratories, Nutley, N. J. under contract to the Sperry Rand Corporation, prime contractor to the Air Force for the ARIS program.

When the C-band radar "tunes in" to the missile, CDCE converts the trajectory and signal strength data into digital form and records it on magnetic tape. The computer then undertakes the complicated task of smoothing the trajectory data. Then, based on what is now predicted, smooth missile trajectory, up-to-date position orders are maintained at ten samples per second—in case the radar should happen to lose track for any reason. Also, to assist tracking during the missile's re-entry period, a computed angular velocity term, allowing for air density and ballistics, is supplied to the tracking servos. With all these safeguards and assists, the accurate plotting of the missile path from the time it is first acquired by the ship's instruments until impact, is assured.

The entire ship's instrumentation and data-handling system is sorted into modes—including the navigation mode and the checkout mode. Naturally, the data-handling system will be in navigation mode most of the time. Routine operating procedures aboard ship specify that periodic celestial or sonar fixes shall be taken and instrumentation checkouts made. While the ship is in the navigation mode, the CDCE converts latitude, longitude, heading, pitch and roll synchro data from SINS to digital form and enters them into the computer, along with time from the ship's time code generator which is also buffered in. Using these data, with star co-ordinates manually selected from a stored table, the computer designates star tracker designation angles.

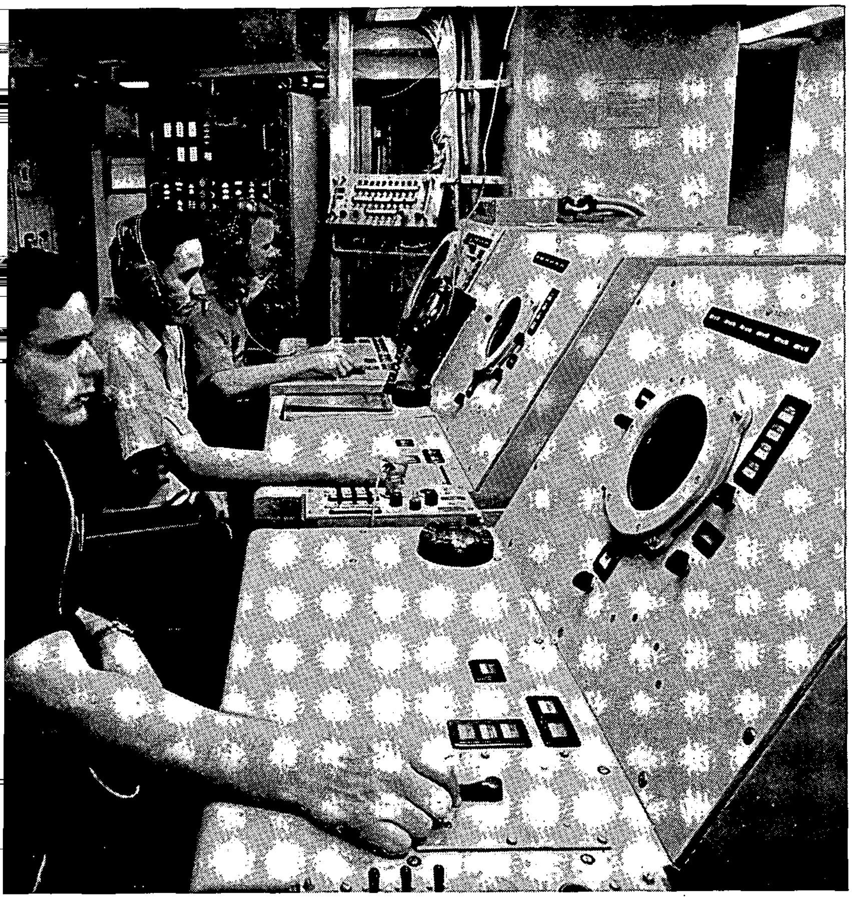
The CDCE then converts the star designation data to synchro form to position the star tracker, and, after acquisition, reads digital star tracker angles into the computer for processing position fixes and determining SINS drift. The latter's reset orders

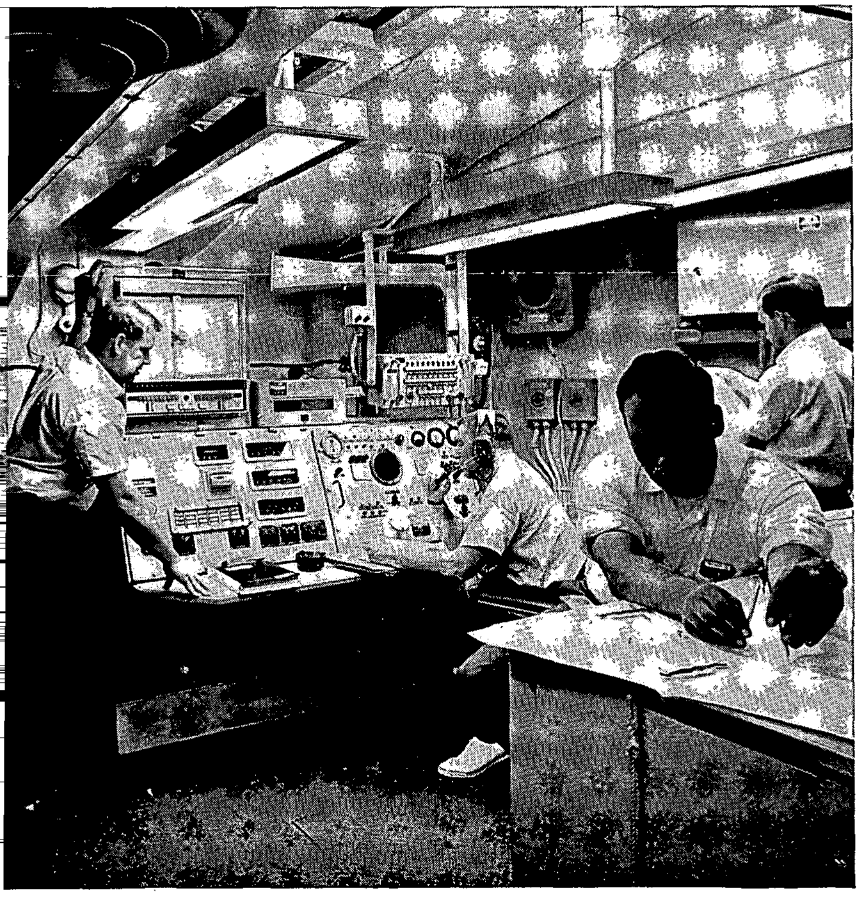
are supplied by CDCE as voltage levels whose duration is determined by the computer. The procedure is practically the same for sonar fixes, except that these readings are entered into the computer manually.

All of these checks and re-checks are an absolute necessity, of course, if meaningful data is to be produced when the checkout mode is entered. One cannot help but wonder what Vasco de Gama, the first white captain to see these waters, would have thought of these navigation instruments. For that matter, even more immediate, wonder what Admiral Chester Nimitz would have thought. No sailor ever saw anything like this before—this is exclusively the brainchild of the '60s.

Obviously, the checkout mode cannot be "moth-balled" entirely until it's called upon to check out missile re-entry. Periodically, and especially prior to a shoot, the instrumentation equipment is transferred from navigation to checkout mode. As a rule, the subsystems perform their checkouts independently but final checks are always a real "dress rehearsal," with the computer, CDCE and the other subsystems tied together. Data of the pre- and post-shoot calibration runs are made on CDCE tapes. After a mission, the computer and CDCE recorders are used to translate recorded data into a format suitable for transmission —or transportation if that is the method used—to the data reduction center.

During a mission, the commuter program is in the Designation-Acquisition-Track (DAT) mode, while the CDCE is converting the synchro angles of the SINS, the AC flexures and the DC signal strengths to digital form, entering them into the computer or recording them. The sample rate, synchronization and sequence are controlled by CDCE. For flexure corrections and regenerative tracking term, AC analog outputs are provided, with





TRACKING Ghostlike blips from a primary and two secondary targets creep across the radar scopes in the *General Arnold's* Integrated Instrumentation Radar (IIR) Room. The IIR which transmits alternate polarizations over C- X- and L-band frequencies is really six radars in one and will gather 3.6 million bits of data per minute about the trajectory and the "signature of an ICBM. Radar contact with an incoming ICBM is expected to be made from the *General Arnold's* position in the target zone about three minutes before impact.

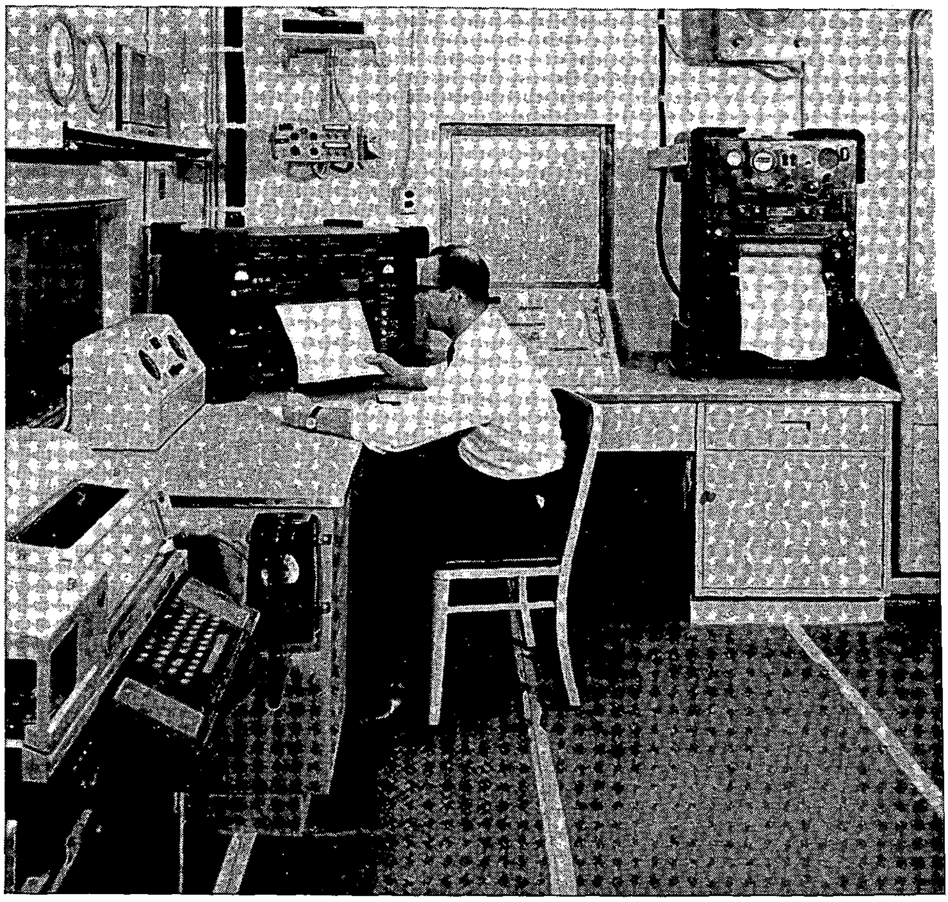
NAVIGATION: A MATTER OF YARDS High on the *General Arnold's* forward superstructure a newly added compartment houses a navigation system similar to that on the Navy's Polaris missile launching submarines—reportedly the most accurate in the world. Built around an inertial guidance system called SINS (Ship's Inertial Navigation System) housed in the compartment's "inner sanctum," the new system must locate the ship—in relationship to Cape Canaveral—within a matter of yards. In the center of the picture is the navigation control console through which all navigational data and decisions funnel. In the foreground is the plotting board, which will be manned by the Alternate-SOM during tracking. These two control positions are surrounded by "black boxes" housing sonar, loran, the Mark 19 gyro-compass, dual-channel recorders, and repeaters.

PHOTOGRAPHS
COURTESY OF SPERRY

SEAGOING "SPACE" SHIPS

800,000,000 CALCULATIONS PER MINUTE The data processing compartment on the USAFS *General Arnold* is built around a UNIVAC 1206 solid-state computer. The militarized computer not only assembles and arranges millions of bits of data on the final moments of an ICBM flight for transmission to analysts at Cape Canaveral but assists other major systems during flight test. It feeds post-launch data from the early portion of the flight to help the radar and telemetry acquire the vehicle as it comes into range, and provides "look angles" to help the star tracker acquire stars for navigational cross referencing. The 1206 was produced by UNIVAC Division of Sperry Rand Corporation.

WEATHER STATION Vital meteorology information to assist in the tracking assignments for the U.S. Air Force's Advanced Range Instrumentation Ships will be gathered in the heavily-instrumented Meteorology Room. Meteorological conditions are gathered by weather balloons, high altitude rockets, and conventional meteorology instruments for use in tracking computations. The ARIS meteorology equipment was one of the shipboard subsystems designed and integrated by ITT Federal Laboratories, Nutley, N. J., a division of International Telephone and Telegraph Corporation, under the direction of the Sperry Rand Corporation, prime contractor for the ARIS project to the U.S.A.F.



SEAGOING "SPACE" SHIPS

DC for plotting. The Designate Controller in the operations-control center issues commands for various intercommunications to be affected by the CDCE. He also determines whether the computer, the C-band radar, or telemetry should be the master. This is a tricky job, performed by evaluating subsystem status indicators, intercom information and the trajectory plot.

All real time communication between the computer and the sensing subsystems is accomplished through the Central Data Conversion Equipment, which is required to process all types of analog and digital data into the computer while affecting sequencing, timing, addressing and mode switching. Utilizing a single AC and DC-to-digital converter, a single synchro-to-digital converter, a single digital-to-digital for matter and common buffer and address circuits, the multiplexer technique is employed. This permits all data to appear simultaneously and continuously on the input to the CDCE. The computer programs and the sequencing requirements permit these data to be sampled in the order commanded by the CDCE.

The multiplexer is a high-speed, all transistorized electronic switching device. One of the inputs is selected on command and directed to the appropriate converter. When the conversion has been completed and the digitized input buffer-stored for acceptance by the computer and the recorder, the multiplexer will select a second input and direct it to the appropriate converter. This device allows the time-shared converters to provide data communication with the computer in uniform format.

Since these ships were built to have a primary mission to acquire data, this first objective is reached when the measured data are recorded. These are of two types: raw trajectory data and signature data. The former include the ship's position and attitude, tracking range and angles, flexures and time. They are converted to digital form without being put through the computer. Signature data consist of signal strength returns of all combinations of horizontal and vertical transmissions and receptions, at three frequencies, from several bodies. In addition, angular displacements from beam centers, attenuator settings, flexures and antenna angles are required for subsequent determination of radar cross-section.

Following the acquisition of all this data it is flown to shore-based computer centers, where a data reduction program produces curves of a radar cross-section as a function of time or range and missile trajectories in earth-referenced co-ordinates.

The possibility of errors is literally squeezed out of the whole process, like juice out of an orange, through the use of regression analysis. All significant sources of error in the instrumentation equipment are included in mathematical error models. On the basis of data gathered during carefully controlled evaluation experiments, the error model coefficients are adjusted until the system error reaches a minimum. A big reduction in the effect of random errors follows the statistical processing within the data reduction program. Subsequent data runs use the same error model coefficients if the instrumentation equipment has not been distributed since making the evaluation. This relieves to some extent the strain of making almost impossibly precise equipment alignments and also removes the effect of some errors which may never be measured directly.

Summing up the data-gathering and processing operation, one hundred technicians aboard each ship begin to check radar and telemetry six hours before each missile is launched ten thousand miles away. Ninety minutes later, the data-handling equipment shows ready and the timing system is checked for accuracy. At T-minus 4 hours, communications receivers, transmitters and recorders are turned on. From T-minus 180 minutes to T-minus 60 minutes all systems are doublechecked, the radars are boresighted, the computer put through a "dry run" and preparations are made for recovery.

One hour before the missile comes into range, all instrumentation systems should report readiness to the ship's instrumentation manager. At T-minus 30 minutes the transmitters are turned on and the computer designates the sensors. A T-minus 15 minutes, the recorders are turned on and the radar and telemetry put into the "master and slave" designate position. By this time, the missile has been in flight for about thirty or forty minutes, is traveling through space at between 25,000 and 30,000 miles per hour and is about 2,500 miles from the ship. Radar contact is made about four minutes before impact and, as a rule, telemetry contact has been made somewhat earlier.

In those vital last two or three minutes of the missile's flight, sixty million to eighty-million bits of information flow into the ship's eagerly grasping receivers through its radar and telemetry systems. A radar video recorder, which allows technicians to go back over the data and pick up additonal targets, that were picked up by radar but not tracked, adds to this total by about forty million to sixty million bits. Thus the ship serves as an agency to gather up to one hundred forty million bits of information in the crucial last four or five minutes of the missile's "life." From this, missile testers are enabled to compile an exhaustive history of the final moments of an intercontinental ballistic missile.

By ten minutes after the impact, the telemetry begins to retransmit the first of the information to a nearby courier aircraft to be flown back to Cape Canaveral. From T-plus 10 minutes to T-plus 180 minutes, calibration rechecks are run, the equipment is secured, weather samples are taken once more and the vessel returns to the comparative quiet of the navigation mode.

To aid in the complex task of having all technicians aboard ship co-ordinated, an interior communication network has been developed for the exclusive use of the instrumentation

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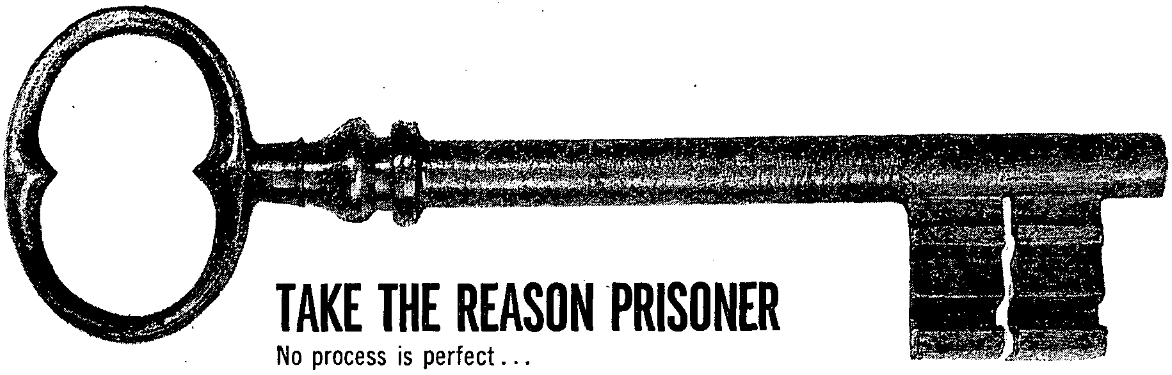


TAKE THE REASON PRISONER

No process is perfect...
but some men always feel unalterably convinced
that their system is the Be all and End all. Psychology now,
should make prisons absolutely escape-proof,
and cure all aberrations...

JOHN J. McGUIRE

Illustrated by George Schelling

Major general (Ret.) James J. Bennington had both professional admiration and personal distaste for the way the politicians maneuvered him.

The party celebrating his arrival as the new warden of Duncannon Processing Prison had begun to mellow. As in any group of men with a common interest, the conversation and jokes centered on that interest. The representatives and senators of the six states which sent criminals to Duncannon, holding glasses more suited to Martini-drinking elephants than human beings, naturally turned their attention to the vagaries in the business of being and remaining elected.

Senator Giles from Pennsylvania and Representative Culpepper of Connecticut accomplished the maneuver. Together they smoothly cut the general out of the group comparing the present tax structure to rape, past the group lamenting the heavy penalties in the latest conflict-of-interest law, into a comparatively quiet corner.

"Well, general, no need to tell you that we are all as happy to have you here as Dr. Thornberry seemed to be," Senator Giles said.

Bennington nodded politely, though he had not been much impressed by the lean, high-voiced man who had greeted him with such open delight. Dr. Thornberry had expressed too much burbling joy when he had been relived of his adminstrative job as Acting Warden, had been overly-happy about resuming his normal duties as Assistant Warden and Chief Psychologist.

"I'm very much interested in some of your ideas on reducing the overhead here, general," Culpepper said, "although I'm also wondering if they may not cost my good friend, the senator, some votes in his district."

"That will be no real worry," Giles said thoughtfully, "if I can show the changes are real economies. Today that's the way to gain votes and I'd come up with more than I'd lose."

"But your turnover," Culpepper said. "I can see that in a regular prison, where they have the men a long time, it's easy to train them in kitchen work and supply. But here . . . How long do you plan to keep them, general?"

"I'll try to get back to the original purpose in setting up Duncannon as quickly as possible," Bennington said. "Dr. Thornberry agreed that five days is the maximum time his sections need to complete the analysis of a prisoner and decide what prison he should go to. After that, we will have sound reason to start charging the individual states for each day we have to keep their consignment."

"Complicated," Giles said. "I mean, the bookkeeping."

"Not at all. I'll either hold the next top-sergeant that comes through here or borrow one from Carlisle or Indiantown Gap. He can set up a sort of morning-report system, and when the states learn they will have to pay us to handle the men *they* should be feeding, we will soon see . . . well, there won't be six hundred and fifty men, women and children stuffed into barracks designed to hold three hundred and fifty."

Bennington had spoken calmly and he lifted his glass casually. But over the rim of his drink he caught the eye of another old soldier.

Ferguson, who had been a private when Bennington had been only a captain in Korea, eased himself to within earshot.

The two had risen in rank and grade together. Thirty-three years had taught them the value of an unobtrusive witness to the general's conversations.

"But with personnel changing so rapidly—frankly, I didn't understand your reference to a replo-depot," Culpepper confessed.

"A replo-depot," Bennington said, calling deep on his reserve of patience, "is the place to which all persons called up for military service must go first. There, they go through a process similar to the one we use here: a complete physical, a complete mental, a complete skill-testing, all used to decide where the man himself can best be used—or imprisoned. Then they are forwarded to that assignment."

Culpepper nodded, but he still seemed puzzled.

"You could waste an awful lot of men on just handling the food and equipment that such a command needs, unless you used the men passing through," Bennington went on. "But, if you have a small permanent cadre who know what to do and how to do it, they can handle large groups of untrained men.

"And you'll not only save money, you'll give these men something to do while they are here," he added.

When Giles and Culpepper exchanged glances, Bennington was immediately and almost totally certain that his explanation had not been needed.

"Seems to me you could economize even more if a part of that permanent cadre were trusties," Giles said.

"I would think so," Culpepper said, "but of course you would have to pick the men very carefully."

Giles approved of that idea. "Responsible men, not hardened criminals. Men who once held a prominent position in their communities, but made a mistake and now would sincerely like a chance to redeem themselves."

"Take the example of Mike Rooney," Culpepper said. "A tragic case, that. He's lost a good government job and with it all his pension and retirement rights. And how? By simply having an accident with a government helicopter when he was using it on a combination of government and personal business.

"Rooney—" Giles said thoughtfully. "Yes, I know him very well. Wonderful chap, nice family of growing boys. Now there is the sort of man who would make you a good trusty, general. I would recommend him very highly."

"I feel the same way," Culpepper said.

Bennington signaled to Ferguson, used the excuse of freshening his drink to cover his thoughts. Rooney . . . Rooney . . . oh, yes, the Internal Revenue official with the odd ideas about whose tax should be collected and whose should be neglected . . . and coming here for processing on a minor charge.

The old run-around, Bennington decided: Put the man in jail on a minor charge until the hullabaloo over his major crime no longer made big headlines.

If word had gotten down to the State level that Rooney was to be taken care of, the former tax collector must be sitting on a lot of hot stuff.

The right phrase here will buy a lot of co-operation, Bennington told himself, remembering the overcrowded barracks, among the long list of things needing a change before this place operated properly.

On a short-term basis, the answer was clear . . .

"Gentlemen, I have no doubt that anyone you recommend for special consideration would, in *some* way, deserve that consideration," he said. "I am further aware that one hand washes another and that if I expect some favors from you, I should expect to do some for you."

He held down his temper while the politicians exchanged glances of mutual congratulation.

"But," he said, "if I establish a trusty system, it will be an honorable one. I would be seen in hell first before I would allow any man to use the setup as a place to hide in comfort during a short rap when he should be sweating out a long one.

"Your friend Rooney will get exactly what he deserves. And not a thing more."

Giles had slowly turned a turkey purple, but his voice remained calm and even. "I think you stated the proposition fairly, general. You will get from us the same amount of consideration that you give us."

The party had been over for an hour, but Ferguson was still at work on the debris. And his old sergeant had, Bennington estimated out of long experience with cleaning up after stag parties, at least another hour's work ahead of him.

The general returned to staring out the big picture window overlooking the prison compound.

Something was wrong . . .

It wasn't Giles and Culpepper. A call to a friend in the Bureau of Internal Revenue, a few words to each of the six governors who had concurred in his appointment, either or both of these would take care of those gentlemen, very thoroughly.

Something else was wrong . . .

He knew the basis of his feeling. He had led troops too many years not to have learned how rapidly a commander can establish a feeling of empathy, even on the first day with a new command.

He knew the basis for the feeling, but he couldn't pinpoint an exact reason.

Or could he?

Why were there absolutely no lights at all in the prison compound?

He spoke over his shoulder to Ferguson, "I'm going for a little walk."

"Want me with you, sir?"

"No, I don't think I'll need you. Keep going and finish up in here."

"Right, sir. You've got your pistol."

The old master sergeant was stating a fact, not asking a question.

"Ha!"

Bennington's barked reply arose from memory of his first argument with Thornberry. The assistant warden-chief psychologist had been astounded to learn that the general did not trust the conditioning process as a solid basis for prison security. Beginning there, the opening engagement in the battle of ideas, their contrasting philosophies had deployed and made the entire prison a battleground.

But Bennington dismissed his chief assistant from his thoughts as soon as he stood in the darkness on the little knoll outside his house. He concentrated on orienting himself.

The camp had not been changed much when it had been made over from a ground-to-air missile station, protecting the freight yards of Harrisburg, into the processing prison for six states.

They had tapped the Juniata a few hundred yards northwest of where it joined the Susquehanna, for the water that filled the moat encircling three sides of the prison. The union of the two rivers formed the water barrier on the east.

What was it Thornberry had said about the moat? Oh, yes, not to keep the poor misguided inmates imprisoned, but to keep unwanted people out . . .

When his eyes were accustomed to the darkness, Bennington walked east and came to the first of the two new additions to the camp. A long building, used by psychological and medical men to determine the total amount ot usefulness to society left in a man convicted of a crime.

Beyond it, the second addition, a barbed-wire-enclosed building called The Cage, where the prisoners were first received and conditioned.

He turned and began retracing his steps, at the same time mentally following what happened to a prisoner in each of the two buildings. When the official party accompanying him to his new post had arrived late yesterday, for the second time he had followed a man through the procedure.

The quick frisking and the slow interview with two purposes, by visual, oral and written tests determining the amount of suggestibility to hypnotic conditioning plus the quicker giving of a card to denote a temporary classification.

Light gray for minor offenses; yellow for major crimes; pink for lifers, psychos and killers; blues for juvenile delinquents; green for all females, with a colored clip-tab denoting the weight of the offense.

A temporary classification it had to be, Bennington decided, for the weight of the offense in itself never measured the man. How many repeaters, men inevitable to a life of crime, had come here to be handed a light gray card in The Cage while other, different men, once-upon-a-timers, had come out carrying the yellow or pink?

Could and did happen, the general knew, could and did happen even in his former military life, where consideration of a man's record was a prerequisite to deciding the sentence, with review and review and review automatic not a matter of initiated appeal.

However, here, in the psycho-med building, was what might be called re-judgment, for here, assisted by the latest advances that could trickle down through the long bureaucracy above—and aided by ideas that yeasted up, not down—Dr. Thornberry's staff went back to basics with the question, what is re-claimable, for the man and for us, in this man?

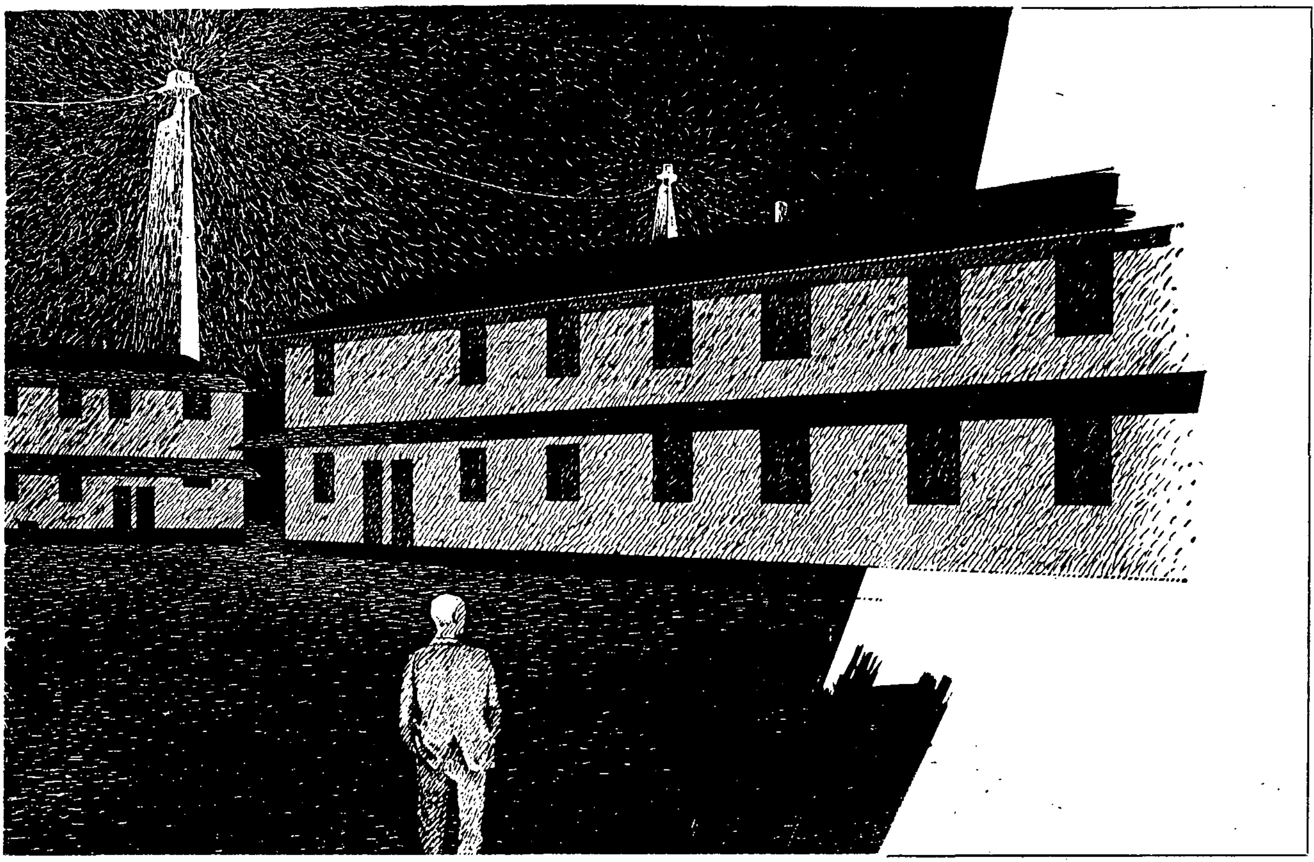
But not the first day . . . that was routine.

Strip and change to prison clothes.

Mental memo: What happened to the civilian clothes that the prisoners surrendered? Was there the smell of a small but lucrative racket here?

Then, on the basis of that preliminary in The Cage, through one of two doors. A few went into the room where a massive injection of sedatives made them virtually vegetables. Most of them, however, were sent into the room where Judkins, the new technician who had also arrived only yesterday, would fit the "tank," the big helmet, down over the prisoner's head and conditioned the man with mechanical and oral hypnosis.

The results, from drugging or hypnosis, were the same. From either room the prisoner came with his face a blank.



Mud-faces, or in a new use of the words from the Original World War, "doughboys".

Those two rooms were harder to get into than to leave. The security precautions of The Cage extended to the moment the prisoner was led to the door and started out of those rooms. But from there on . . .

No, Bennington decided, let's drop security for a moment. Something had happened in the rest of the processing he and the committee had watched and the meaning of that something had emerged only tonight at the party.

Not in the physical . . . and that had been good, as complete as the most expensive clinic Bennington had ever seen, a thorough probing for a structural reason behind the crime or crimes . . .

But the second mental, that quick recheck of the completeness of the drugging or the hypnosis . . . It had been there that both Giles and Culpepper had been very, very interested to learn if anything a prisoner said at this point was admissible in a court of law.

The general now understood their relief at Thornberry's explanation: Anything a man said while under the influence of psychological conditioning was considered as obtained under duress.

Bennington was still mediating on what Rooney could reveal as he walked around the mess hall in the center of the compound. Then he turned to consider again his prison's routine.

He leaned against the south wall of the mess hall and looked across at the four barrack buildings bulking against the darkness. They were the two-story type the Army erects for temporary purposes and uses permanently.

The smell from the overcrowded buildings hit his nose again as strongly as it had in the afternoon.

And sounds hit his ears, soft sounds that had been muffled by the long mess hall between him and their source, low sounds further kept from him by the light wind from the north.

The lights in the barracks had been off since 2100, except, of course, for the eerie-blue night lights, and the prisoners should be in their bunks, asleep or at least silent, immobile.

But why were all the lights off in the compound, and Bennington damned himself for not seeking the answer to the question before.

Thornberry would tell me there is no need for light, that the prisoners can't escape because their drugging has made them unable, or their conditioning has made them afraid, to leave the prison.

The sounds, the flickering like fireflies or carefully thumbed flashlights, didn't come from his near right, Number One, minor crimes, or Number Two, major crimes exclusive of murder.

They came from between Three and Four.

Number Three. Psychos, sex deviates and murderers, with a couple of padded cells and barred windows needed upstairs, even though the inmates were conditioned.

Number Four changed by the addition of an extra latrine for the second floor. Females on the first, juvenile delinquents on the second.

Bennington had learned to move like a ghost, move quietly or die, on the almost-forgotten battlefields of a police action in Korea. He had had a post-graduate course in the South-East Asian jungles. On the Chilean desert he had added to his skills.

He moved now as he had then.

But there was little reason for caution. The guards were too busy collecting their fees, the juvenile delinquents were too busy acting as ushers, with even the sex deviates from Number Three busy.

The customers, of course, were far too interested in what they were buying.

And there was nothing to be done tonight, Bennington snarled to himself, as he carefully made his way back to the house.

But tomorrow morning . . .

A good breakfast inside of him, the early morning sun brightening the scene before him, not even combined could they dispel any of Bennington's bitter anger at the memory of last night's saturnalia.

He marched across the twenty-five feet separating his house from the Administration Building, a long, two-story structure on the western end of the compound.

The entire end nearest his house was taken up by Message Center, the one room which had had Bennington's full approval on his tour of inspection both times he had seen the prison. Internally, the separate parts of the prison were linked together by telephone, a P.A. system, and intercom. The outside world could be reached or could come to them by 'phone, radio, teletype, and facsimile reproduction.

Bennington opened the door, glanced up to check his wristwatch with the big clock on the wall.

0800.

He stepped inside, closed the door, looked around.

The man on night duty was sound asleep.

Bennington coughed once, loudly. The man raised his head and looked sleepily around.

"Are you the only one here?"

"The others come in around nine," the clerk said, yawning, bleary-eyed.

"I see. Did anything come in last night?"

"That stuff." A wave toward a roll of yellow teletype paper.

Bennington stared at the man, continued to stare until the clerk flushed a deep red. Finally the night man straightened in his chair, then stood up. He picked up the roll of paper and came around his desk.

"Sir," he said, "this report came in last night. It is a list of the prisoners we can expect to receive today and the probable time of their arrival."

"Thank you," Bennington said, accepting the roll. "I will be in my office if anyone is looking for me."

"Sir . . ." the clerk gulped, hesitated, forced out the words. "That's the only copy."

Bennington looked the man directly in the eyes. "You must have been very busy last night." He returned the roll of paper. "I'll be in my office."

"Yes, sir!"

Bennington started to walk away, but before he reached the door, the clerk, a man Bennington remembered as being on day duty on his first visit, began to sputter, "Sir, the quickest way to your office—"

The general glanced over his shoulder, then continued on his way.

Before he could get to the door he had chosen, he heard behind him the electrotyper chattering away like an automatic weapon with a weak sear spring.

Bennington could have left by a door leading into Dr. Thornberry's office and gone on through another door into his own big office. But he wanted to check on the availability of the rest of the staff.

The door he opened led into a long hallway. On the left was the long room where Thornberry's psych-med staff had their personal desks and permanent records. On the right, a door leading to Thornberry's office, but none into his own. His room was reached only through the office of a clerk-receptionist or Thornberry's.

Down the hall, past the wide main entrance with its glimpse of the flagpole outside and inside the stairs leading to the second floor, where a large part of the permanent staff were given rent-free quarters.

The armory, on his left just beyond the entrance, a room as long as the med-staff's, but unlike the other—and who had the brains to do this—locked.

Across from the armory, a big room for the rest of the administrative staff, but no one on duty.

The supply room, corresponding in size and location to the Message Center on the other end, unlocked and no one in it, with everything the prison received on open shelves, available to any reaching hand.

Bennington went back the hall, through his secretary's room into his own office.

One sleepy clerk and himself on duty—he looked at his watch—0815.

. . . *There were going to be some changes made* . . .

He spun his chair around and looked out the big window directly behind his desk. He noted the fact that about twenty feet away the land dropped into a very deep slant to the western arm of the moat, but the fact recorded itself only because he always made subconscious notes of the military aspects of terrain.

Consciously, he was wondering why the vast expanse of good, rich earth, north, west and south of the prison, acres of fine land that had been and still were a part of this former military post, had never been put to productive use.

How easily Duncannon could become more self-supporting—and even though Giles and Culpepper wanted to make a racket of the idea, there was much to be said for a trusty system.

Hold it, he told himself, *those ideas and where we'll set up a laundry—it's utterly ridiculous that we have to send everything into Harrisburg!—can come later. Right now let's think about an appointment list . . . and the first name is my good assistant warden's, Dr. Thornberry.*

Still looking out the window, he leaned back in his chair and felt again the slow boil of anger.

A gentle rap on his office door, the one opening from his secretary's office.

Bennington swung around to face his desk again. "Come in."

The Message Center clerk, with a neat stack of papers. "Sir, this is your copy of the report received last night. The original is on file in Message Center and other copies are on the desks of the people who will need them."

"Thank you," Bennington said. "I am sure that this procedure will be followed in the future."

"Yes, sir!"

It will be in your case, Bennington decided, then truned his attention to the report.

The distribution list in the upper righthand corner was —h-m-m-m, good. Himself, Chief Psychologist, Chief Guard, Kitchen, Supply. Probably set up by the same man who had designed Message Center itself.

The report was not good.

The first paragraph was a summary and it was almost all bad news. Total: 35. No women, no juveniles, the only good reading. But they were coming from all six states and all but one of them Barracks Two and Three cases. Assembled at Philadelphia, by train to Harrisburg, by truck to here, but not arriving until 1530.

Two and Three were overcrowded now. With their communications so good, why couldn't they move the processed men out faster?

And this new group would arrive so late. Couldn't even begin processing them. Or could they?

Might have to.

Let's look at the details.

Connecticut: Musto, John, and his brothers, Ralph and Pietro. Murders. Following those names, five others of the gang that had terrorized the banks in that area for two years. Capturing all of them at once by putting a sleep-gas bomb in a basket of groceries delivered to their hideout, that had been a neat bit of police work. But till those boys were conditioned or drugged, they would need special guards.

Delaware: Clarens: Walter. Murders. The name was familiar—Oh. yes, three killings, one of them a little girl with whose blood Clarens had written at the scene, "For God's sake, catch me before I kill again." Well, Thornberry would be happy.

Maryland: Major crimes, but no killers.

New Jersey: The usual list from the waterfronts and the usual wide variety of manslaughter and homocide.

New York: Dalton, Harry. Let's see, haven't I . . . yes, "The Man No Jail Can Hold." Another special guard.

Pennsylvania: . . . .

The name jumped out, *Rooney, Michael.*

The intercom on his desk buzzed and he flipped the switch. "Go ahead, Bennington here," he said, and realized only after he had spoken how the thought of Rooney had made his voice a growl.

"Dr. Thornberry, sir. May I see you?"

"By all means," Bennington said. "The sooner, the better."

Thornberry started talking as soon as he opened the door between the two offices.

"General, did you see the list of new arrivals? Of all people, Dalton! And arriving too late to be conditioned!"

Bennington said nothing until the psychologist had seated himself. He simply watched his chief assistant and tried to find some reason to like the man.

"What do you mean," he finally said, "too late to be conditioned?"

Having just considered this problem, Bennington's question was a testing of Thornberry, not a request for information.

Thornberry was looking aggrieved, as if the fact was so obvious even the general could understand it. "Processing takes all day, sir, and this group does not arrive until late afternoon."

"Does the processing have to be continuous?" Bennington hoped his chief assistant would show a little flexibility.

But the question threw the bureaucratic psychologist into mental dishevelment. "I beg your pardon?"

"All we have to worry about is keeping them quiet tonight, then you can slip them back to normal in the morning and run them through as if they had arrived tomorrow."

Thornberry pursed his lips. "But that would mean—"

"A little extra work on the part of very few men," Bennington snapped. "We'll keep them away from the rest tonight by sleeping them in The Cage. A couple of men in Supply can move cots and blankets over there now. Feed them coffee and sandwiches. Call the Mess Hall and get them made up. At the same time I know you'll find three or four men who want the overtime for dishing it out.

"How long do you need to know if you can use hypnosis or if you need drugs, and wouldn't it be simpler to drug the whole lot?"

"No, definitely not the last," and for the first time Thornberry was being positive, "because we have to use a massive dose and they can't shake it till—day after tomorrow, at the best tomorrow afternoon."

"The Army can decide to hypno in two minutes with a spin-dizzy wheel and some lights. How long for you?"

Thornberry bridled. "The same, especially if *I* do it."

"Good. So now you need a doctor to drug the ones who need it, a psychologist to decide who gets what, one machine moved and one technician." Bennington snapped on his intercom, said his secretary, "Get Judkins in here."

"Yes, *sir*!"

The word seems to be getting around, Bennington decided, *but this will take a moment.*

He started on his next problem. "Have you ever inspected the prison grounds at night?"

"No, sir! That is Slater's duty!"

Thornberry was again the proper bureaucrat, horrified at the thought of invading another's domain.

"Judkins here," came from the intercom.

"Bennington speaking. You know the corridor between the reception and interview rooms in The Cage?"

"Yes, sir."

"Get your equipment over close to there. We have a group of prisoners arriving around 1530, too late for complete processing. But at least you can condition them against escape."

The intercom was silent a moment, then, "But how will I know who I'm working on?"

Bennington questioned Thornberry with a raised eyebrow.

The psych-expert shook his head, no.

"This time you don't need to know," Bennington said. "Get your equipment set up and report to me when it's ready."

Another long silence, then, "Yes, sir."

"He should know who he has under the hood," Thornberry said thoughtfully, after Bennington had silenced the intercom, "especially since the group includes a man like Dalton—"

"We have something more important to discuss," Bennington cut in, dismissing the subject. "Last night I inspected the prison compound."

He described what he had found, then leaned back to hear Thornberry's reaction.

"That's not in the least what I told him he could do," the psychologist said.

"What! This is your idea?"

Thornberry was equally astounded at Bennington's reaction. "Yes, of course. As soon as I took over as Acting Warden, I told Slater that social visits between the prisoners were entirely permissible until Lights Out. But this—"

The psychologist shook his head, then appeared to reconsider and his face brightened. "But it's a step in the right direction. Naturally, I prefer the Mexican system where the wife is permitted regular, very private, visits to her husband—"

"Let me get this straight." Bennington felt like a man lost in a maze. "You told the Chief Guard that the prisoners could visit each other—"

"No, not all of them," Thornberry interrupted. "I never meant that some of the problem cases, like a few of those in Number Three, should have complete social relationships."

"Just exactly what were you thinking of when you gave that order?"

"Thinking of? Why, sir, I was thinking of our poor patients here. Society has ordered them confined, yes, but need we necessarily deprive them of *all* human rights?"

Thornberry seemed ready to orate for an hour, but Bennington stopped him with a gesture. "All right, I've handled POW camps, maybe in one way I can see your point. But we can take up the philosophy of this later.

"Right now, this is the essential fact, that Slater has taken your order and twisted it into a racket.

"So let's talk to Slater."

But the intercom said, "He hasn't come on duty yet."

"He has the room at the head of the stairs," Thornberry said.

The door was locked, but the psychologist produced a set of master keys.

"I want a set of those, too," Bennington said.

The room was heavy with the smells of cheap whiskey, stale cigarette smoke and human sweat. Two figures were sprawled on the bed. A hairy, bearlike man, Slater; a big well-built brunette.

Thornberry squinted through the gloom, then turned on the lights. "That's Mona Sitwell," he said, "and I'm sure she was supposed to be on orders to leave here two weeks ago."

Bennington remembered the case, the spinster who had found her parents a hindrance to her extensive enjoyment of male companionship. She had literally chopped up their objections.

"Follow through on the orders you give sometime," Bennington said dryly. "You may meet a few more surprises."

The man on the bed stirred, threw his arm up over his eyes. "What do you want?" he mumbled sleepily.

Bennington mentally cursed the Civil Service regulations which tied his hands, and left him only one thing to say: "Your immediate resignation."

"Message Center, sir."

"Go ahead." The general looked at the desk clock. 1515. He could guess what they wanted to tell him.

"Sir, the new consignment will be here in about ten minutes."

"Thanks. Pass the word along to Dr. Thornberry and add, I'll meet him at the flagpole in five minutes."

Bennington pushed back his chair, slowly stood up. This had already been a full day's work.

Slater had been worse sober than he had been sleepy and half-drunk. His covering barrage of threats on leaving the prison had been equally divided between the general's personal health and the entire prison setup.

Thornberry had screened the other guards. And, after sitting in on only two sessions, Bennington had at last found one small reason to like his chief assistant. The psych-expert could spot a liar almost before the man opened his mouth.

But right now, and, at the wages offered, probably for a long time, Duncannon was very short of guards.

Judkins was ready in The Cage. An efficient man, but he had been a little resentful at the extra work involved in moving his equipment.

The prisoners would remain in The Cage overnight, except for their trips to the Mess Hall. A reorganized supply room had disgorged more than enough cots and blankets to convert The Cage into a temporary dormitory.

Bennington riffled the papers on his desk showing when the prisoners on hand had been received and how long they had been ready to go to their assigned prison. This matter took top priority. Some of the people had been here over a month. If he could push through the plan to charge the states for every day Duncannon kept a prisoner after the criminal was ready for shipment, then the various states should each pay, as a rough estimate showed . . .

But the clock on the desk showed 1520, time to meet Thornberry. With longer than usual steps, Bennington strode out of his office and out the main door of the Administration Building.

Thornberry was pacing around the flagpole directly opposite the main entrance.

"This man, Dalton," the psychologist said, falling in step with the general, "you know he escaped from us twice."

"Make him the first through," and Bennington dismissed the subject. "I'm more interested in this. Are there any ex-service men among the group?"

Thornberry sniffed. "Still worried about our conditioning and our security, general? I repeat, even though we do not use the lobotomies and other techniques of our cold-war competitors, we can nevertheless condition anyone sent to us so that he will not make any trouble."

Bennington shrugged. "I'd like to see you work on a para-commando. Or one of the General Staff."

Thornberry, now leading the way through the Processing Building, called back over his shoulder. "How many of them end up in prison? I mean, from the General Staff? The para-coms do, of course, they just can't adjust to civilian life and I think the Army should do something about that before they discharge them. But they never come here without an accompanying court order allowing us to use the eyeball technique."

Along the short path, enclosed by barbed wire, from Processing into The Cage. Swiftly along the corridor behind the one-way vision mirrors, down the walk to the gate in the barbed wire.

Bennington looked around and nodded approval: his reception committee for the new arrivals was waiting.

He looked acrosss the river toward Harrisburg. Yes, just turning into the bridge approach, two tractor-trailer combos, preceded and followed by white cars.

Bennington glanced around again. From the roof of The Cage, Ferguson, drafted as a guard for this emergency, waved and lovingly patted the butt of his submachine gun.

One of the regular guards gave the general a sound-powered megaphone. He nodded thanks, lifted it.

"Give me your attention!"

"The procedure is as usual except that, when the prisoners go into The Cage, they are going to get an overnight conditioning treatment.

"But until they've had that treatment, you must be alert! These are all dangerous men."

Beside the general, Thornberry whispered hearty agreement. "Yes, yes! Except for Rooney, everyone on that list is here for armed robbery or murder and usually both."

Bennington lowered his megaphone. "I almost forgot to tell you. I added a complete physical search to your metal-detectors, we're doing it right inside the door to the corridor.

"And we're keeping all their personal effects. That was bad, Dr. Thornberry, letting them have their money. As long as a prisoner has cash, you can't trust any guard."

Thornberry froze. "As prison psychologist, I protest. I consider those procedures an unwarranted invasion of physical privacy and a forcing of a man into dependency with traumatic effects—"

"I would much rather make a prisoner dependent on my good will than have him bribe my guards, doctor. And I would much rather invade his privacy than have him invade my stomach with a knife made out of bone.

"A metal-spotter is, perhaps, good, but too many killing tools can get by them."

Thornberry seemed more than willing to continue the discussion, but the tractor-trailers were pulling off the bridge. After a moment's jockeying, they turned so that the back of the trailers pointed toward The Cage.

A corporal eased out of the white car that had led the convoy. He shifted his shotgun to his left arm, saluted, said, "General Bennington? Corporal Forester, with thirty-four prisoners."

"Thirty-four? We expected thirty-five."

"Ralph Musto tried to get another idea in the Harrisburg terminal. He'll be in the hospital about ten days."

"Musto?" For a moment, the name meant nothing to Bennington.

"Connecticut, sir, one of the murder and bank cases. Are you prepared to accept delivery of the others?"

"Yes, we are. But we are unfortunately a little shorthanded today. . ."

"We always stay around till the boys are in The Cage, sir," the corporal said.

"Thanks. Start unloading."

Corporal Forester saluted again and turned to face the vans. He waved his arm and another trooper unlocked the door of the trailer to the general's left. A group of men slowly jumped out and stood blinking in the sun.

A trooper opened a large compartment beneath the van and yanked out several large bags, all locked, all bulging, all the type Bennington had known too well since the Second War.

The prisoners' personal effects, Bennington decided, and lifted his megaphone.

"Form a single line facing the gate," he commanded.

There was an excess of shuffling movement, but at last a line was formed.

Corporal Forester waved his hand again. The doors of the trailer were locked and it started across the bridge.

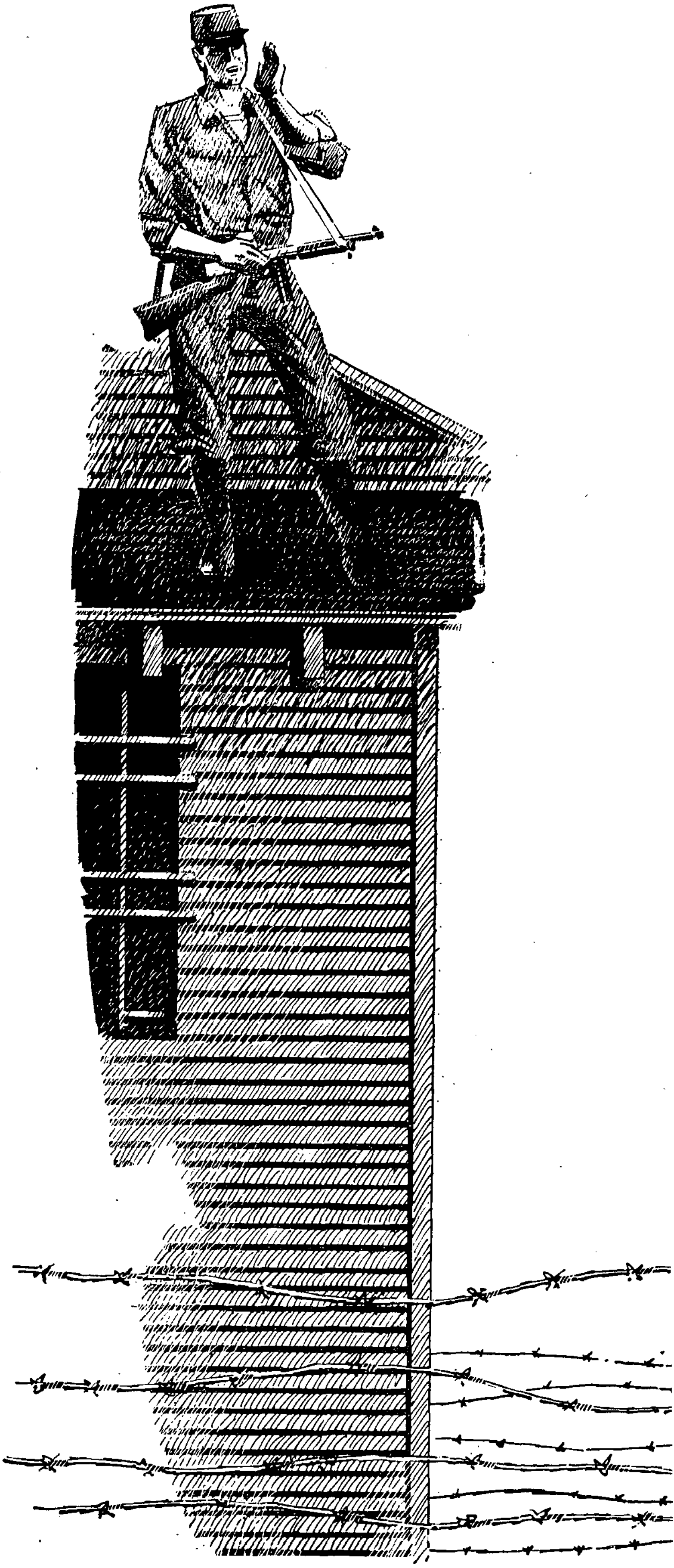
Then the second trailer was unloaded and sent away. When its cargo had added themselves to the line, the corporal again approached Bennington.

"Want a roll call, sir?"

"The count is correct, but a roll call will help get them in order, in the right frame of mind." Bennington raised his megaphone to his lips. "Now get this! When your name is called, sound out HERE and run for that gate. Then walk up the path and through the open door.

"John Musto."

A stockily-built, dark-faced man stepped from the line



and with an exaggerated slowness dawdled toward the gate. His pose lasted only a moment. One of the Duncannon guards stepped forward and smacked his rifle barrel across Musto's kidneys. The bank robber and murderer pitched headlong to his knees, got up slowly with a snarl. But when the guard gestured again with his rifle, Musto broke into a shambling run.

Bennington waited until the first of the brothers stood panting at the gate, then called, "Pietro Musto."

One example had been enough. Pietro took off on the double. In five minutes the last man had vanished into The Cage.

"You get these, too, sir." Corporal Forester, with a bundle of papers.

"Right. And thanks for staying, corporal. By the way, isn't there something I sign?"

The trooper produced a form and a pen. Bennington signed and they saluted each other. The corporal grinned, then his expression sobered. "That's a real bunch there, sir."

"We're conditioning them immediately, corporal."

"Good idea, sir. The sooner, the better!"

With another salute, the corporal turned to his car and Bennington started toward The Cage.

Inside The Cage, Bennington went into the corridor that led behind the mirrors. He wanted to watch the weapons-check and the conditioning; he found Thornberry waiting for him.

Bennington looked through the mirrors at the men standing as he and his party had stood yesterday. Room One of The Cage was marked off into numbered squares. Each man stood on a number, separated from his brother cons by about ten square feet. They knew they were being watched, although the men behind the mirrors were invisible to the prisoners. They stirred restlessly, standing first on one foot, then on the other, looking uneasily in all directions and seeing nothing but their own reflections.

"Dalton is on Ten," Thornberry said.

Bennington looked and saw an exceedingly average-looking man. Wouldn't notice him in a crowd, the general thought and realized that he had learned one reason for Dalton's success.

"Start the random sequence with him," he said. The system was set up so that no prisoner knew when he would be summoned.

"I told them to do that," Thornberry said.

"Number Ten", the loud-speaker boomed.

The general moved down the corridor until he was looking into the hallway between Room One and Room Two. Until yesterday, the prisoners had simply walked down the corridor while detectors checked them for the presence of metals. They had then been held at the end of the hallway until they had stripped themselves of everything that had registered on the screens.

Today was different. Inside the door Dalton was being thoroughly and completely searched. Nothing was found, but Bennington could sense Thornberry's grim disapproval of the procedure.

Dalton was then shoved around the first of the hastily-erected screens and ordered into a chair. A doctor beside the chair was ready with an injection so smoothly and quickly that Dalton was under mild sedation almost before he was aware of the needle's sting.

Across from Dalton, seated at a small table behind a spin-dizzy wheel of flickering lights and ever-centering spiral, one of Thornberry's psych-staff waited for a nod from the doctor. Then he started the wheel spinning and Bennington could see his lips move.

After a moment, the psychologist turned his head to the doctor and Bennington lip-read the word, "hypno." The doctor slowly put down one of the biggest hypodermic needles Bennington had ever seen.

Less roughly, the guard led Dalton around the second screen.

At the end of the corridor Judkins was ready. He adjusted the big hood over Dalton's head. . .

And Bennington turned away.

He had seen too much of the conditioning process, beginning in its early days when the Army had realized its value in reducing the manpower needed to watch the refuse of the cold war.

The POWS from the battles of the little undeclared wars; the refugee camps, with their possible and probable subversives; the Army disciplinary stations . . .

He waited farther down the corridor where he could look into Room Two. In a few minutes Dalton entered. His face was subtly changed. A guard gestured toward the piles of cots and blankets.

Dalton took one of the cots and two of the blankets, moved to Square Number Ten on this side of the building and began making up his bed. When the job was completed he sat down.

His back was toward the general and Bennington found himself wishing he could see the prisoner's face. In the other room, Dalton had been carefully, thoughtfully staring around.

His posture now spoke of a total lack of interest in his present surroundings.

Bennington glanced at his watch and estimated the time needed on Dalton. Hm-m-m, little better than five minutes. Of course, if a prisoner was given that second shot. . . Well, the average would be still about five minutes.

Might as well go back to the office and work out how much each state owed the prison.

Thornberry's call came at 1915. "We've finished, general, and we're ready to feed them. Of course, we still have some things to put away over here—"

"Skip it," Bennington said. "We can have that done tomorrow morning."

"Judkins has asked permission to go to Harrisburg tonight. He wants to see his sister about an apartment there. Several of the permanent personnel do that. It's easy to get back and forth, and there's more to do—"

"Tell him to take off. And let's see, we'll need him in the morning, but maybe we can give him the afternoon off in return for his overtime work tonight."

"I like that, general, and I'll do it. Now, I'm going to see that the prisoners are fed, then I'd like to see you in your office."

"I want to see you, too, Dr. Thornberry. Tell Ferguson to arrange supper for two over here—I haven't eaten either."

"I'll be with you in about fifteen minutes."

Because the office was sound-conditioned, Bennington did not know that the riot had started until the door slammed open and three men jammed the doorway, all three trying to get in at once.

Acting by reflex, Bennington shot the man in the center. The other two, entangled with the dead man, also tumbled to the floor.

The general promptly shot twice more.

Then he paused to think.

One glance told him his instinctive action had been correct. The man in the center had been Pietro Musto, carrying a carving knife. The other two . . . yes, they had been in the group that had arrived this afternoon.

But what was wrong? He had watched these men being conditioned. . .

A burst from a submachine gun echoed through the open door.

First thought: *They've got the armory!*

Second thought: *This is no place for me!*

He picked up his desk chair and smashed the picture window looking out over the moat on the west side. Then he smashed with the chair again to remove the fragments that stuck up like jagged knives.

A quick leap over the sill into the darkness, a twenty-foot sprint, and he was able to throw himself down on the steep slope that five feet farther on became the moat.

Just in time, he discovered. When he peered through the sparse grass, he could see two men in his office. One had a shotgun, the other a rifle. The man with the rifle lifted it to his shoulder and fired into the ceiling.

Most of the staff, all but six of the guards up there, Bennington thought.

Resting his right hand against his left arm, he took careful aim and fired. The man with the rifle staggered and fell. The one with the shotgun dropped completely out of sight.

Bennington heard someone shouting hoarsely about the lights.

The first floor blacked out.

He took a deep breath, held it, slowly released it. Then he was able to think.

How this had started was for the moment unimportant. First came the problem of regaining control.

To regain control, he needed help. To get help he had to reach the nearest visiphone.

Glass tinkled to his right. Almost too late Bennington remembered how his white hair could reflect the lights from the second-story windows. He rolled rapidly to his left and a little more down the slope.

The dew-wet grass chilled his face and hands. His long legs felt the water of the moat creep up past his knees.

A semiautomatic rifle with carefully timed shots searched the area where he had been. "Good man," he noted professionally and replied with a pistol shot. He rolled again back to where he had been, but still further down the slope.

The rifle spoke copper-coated syllables once more, with a sequence of shots that started where he had fired from. But this time the sequence hunted further to both right and left.

This could go on all night.

He *had* to get to a visiphone. Yet he couldn't leave here. The moment he did, the convicts had a wide-open road to freedom.

The man with the rifle was good, Bennington noted again. His shots were grass clippers that could have substituted for a lawn mower.

Then a submachine gun chuckled crisply from Bennington's left. There was a howl of pain. The rifle stopped looking for the general.

Bennington began crawling along the edge of the moat. That submachine gun had spoken for his side of the argument and he had a big need for the author who had used its words so well. He stopped crawling. Someone was coming toward him.

"General?"

"Ferguson!"

"Yes, sir. You all right?"

"Yes. And you?"

"Fine, sir, but it was close for a minute."

"Tell me."

"I was coming in the door to Message Center, going to put my gun back in the armory, then get your supper from the kitchen. I heard someone screeching down the hall and then a couple of shots. The clerk on duty got up and started toward the hall door. But it banged open in his face and someone emptied a pistol into him. I let loose a burst and jumped back. The guy with the pistol came through the door, still hollering. I gave him a bellyfull, then waited a moment to see if anyone was behind him. Nobody was. I remembered hearing a window smash, so I looked around this way for you."

"You've got how much ammo?"

"About a half clip, sir."

"We need help. I know they've got Message Center, but—"

"The private line from the house sir?"

"Right. And you'll stay here."

Ferguson understood. "No one will get out this way, sir, but I'll go with you part way so I can cover the door out of Message Center, too."

No more words. Not even a handshake.

These two had worked together, fought together, before. Speeches weren't needed.

Bennington's house was dark and, because it was still new to him, he barked his shins twice before he found the visiphone. To save time and avoid any lights, he first cut out the visual circuit and then he simply dialed "O".

"Operator," a lilting voice replied.

"Connect me with the nearest State Police Barracks, please. Warden of Duncannon Prison speaking."

"One moment, please." Not a change in the lilt.

Silence, then, "State Police Barracks, Private Endrews speaking."

"Warden Bennington, Duncannon Prison. We're having trouble here and I need help. About thirty prisoners have seized control of our Administration Building, which includes the armory."

"Riot? Duncannon? Impossible! Those men are con—"

"It may be impossible, but it's happening. Now, how much help can you give me?"

"Let me check, sir." The phone was silent, except for heavy breathing from Private Endrews. "Here it is, sir. In less than fifteen minutes, three cars—that's six men and they've got full equipment in those cars—will be at The Cage."

"That all?"

"No, sir. In twenty minutes I'll have the riot-control copter over the prison. It's got floodlights on its belly and the pilot knows the prison."

"Good. What else?"

"For at least two hours, that's all, sir. Standard Operating Procedure calls for the immediate establishment of a cordon at fixed points, roving patrols on the countryside west of you and blocks on all railroads, bus and air terminals—"

"Someone will be in the parking lot. Give me what you have and get it moving!"

It wouldn't be enough. Half of the permanent staff as hostages, enough weapons and ammo in the armory to fight a war. . .

He dialed again. "Operator? I want the Commanding General at Indiantown Gap. Now!"

"One moment, sir." The lilt was gone from the voice. She had been listening in, the general decided.

"Duty Officer, Indiantown Gap, Major Smith speaking."

"Smith? Connect me immediately with General Mosby!"

"I'm sorry, but the general is—"

"Major, get off the line and get Mossback on before—"

There was a click, another telephone rang three times, then a calm voice, "General Mosby".

"Bennington here!"

"Jim! You old—"

"No time, Mossback. I need help. I'm down at Duncannon Prison. Got a riot on my hands, two gateguards plus myself and Ferguson to handle it. The State police can give me only another six men, in the next two hours."

"One moment, Jim. Duty Officer! The First Battalion, riot-armed, on the field and in their copters in twenty minutes!"

"Second and Third Battalions fully-armed, with all support sections, ready to roll in forty minutes!"

"Yes, sir!"

"Give me the whole picture, Jim. And by the way, I've visited the prison."

Bennington gave the details in less than a minute, then added, "Thanks, Mossback."

While he had been talking, Bennington had also been listening. From Mosby's end of the line came clearly that most reassuring sound, the great bull-speakers thundering out the orders that meant for a few moments rapid running and confusion, then in a few moments more the resolution of the confusion into disciplined movement.

Knowing Mosby, Bennington also knew that the copters would be loaded in twenty minutes.

"Thanks again," he said.

"Thank *you*, Jim. I've been moaning for a chance to check our training. See you in half an hour."

"You'll see me—"

"Sure. Don't think I'd miss a real shootin' match, do you? Hang on till then." The line was dead.

Hang on till then.

Easier said than done.

Well, step number one, survey the situation and the terrain.

A glance at his watch startled him. Though his combat experience had taught him how time could compress and stretch, the fact that only seven minutes ago he had been considering supper in his office came as a shock.

He took no chances but left his house as he had come, by the back door. Then stepping quietly but quickly, he went to the south side of the Processing Building at the corner nearest the Administration Building. All the offices were dark. Only scratches of light—probably matches to cigarette tips—flickered briefly out of the windows of the second-story where the staff was housed.

The mess hall was also dark but as Bennnington watched, a short burst of submachine gun fire tracered across the darkness from the kitchen toward the armory.

"Listen, you screws, listen to this!"

The gigantic voice thundered through every corner of the compound. For a second Bennington was startled, then he remembered. The rioters controlled Message Center and the PA system.

"Stop shooting at us. Don't forget that half your staff is in here. Every time you shoot one of us, we are shooting one of them."

The words came through on only part of Bennington's attention. They registered, but he was also studying the seventy feet of open ground between him and the nearest door into the mess hall.

The big voice again filled the compound.

"We want to talk to the warden if he's still alive. Or whoever can take his place if he ain't. You got five minutes to call us on the intercom."

I can talk to them from the kitchen if I can get there, Bennington thought.

He glanced back over his shoulder. The moon, though full, was only part-way up.

I'm sixty-five, but maybe I've got one fast run still left.

He did. He made it without a shot being fired.

But he stayed on his belly just outside the door, remembering the submachine gun. From the shadow of the step into the mess hall, he used his command voice to get safe passage.

"Thornberry!"

"General Bennington!"

The psychologist almost twisted Bennington's hand off before he could speak. Then his first words puzzled the general. "We've got to find Judkins."

"Why?"

"I want to know what went wrong—"

"That can wait. Let's put the fire out first, then learn how it started. Who's here with you?"

"The two guards. Rayburne! Householder! Come here!"

"Only those two? Where's the kitchen staff?"

"Dead," said Thornberry soberly.

There was a roaring in the skies and through a window Bennington could see the compound was almost as brightly lit up as it was by day.

"The riot-copter, and before I expected it," the general said. "I've been in touch with the State police. And the Army."

There was another short burst of submachine fire. Bennington mentally placed it as behind the Administration Building. *Someone trying to sneak out the back way...*

"Stop that shooting!" The PA confirmed his thoughts. "No one else is going to try to leave here. Warden, get on that intercom!"

Got to hurry, Bennington thought, *I've got to get them talking and keep them talking.*

"Householder and Rayburne, get over to the parking lot. The State police are coming there. Bring five of the six over here. Keep the other man by his car radio. If he can switch to the Army frequency, or can get in touch with the Army copters through his Headquarters, guide their planes to land behind Barracks Four. Tell General Mosby where I am. Tell him before he lands, so that he can plan his deployment.

"Take off. Thornberry, come with me."

The two of them clambered over the counter and carefully, to avoid stepping on the dead, made their way to the kitchen office in the southwest corner of the mess hall. Through one of its windows, the Administration Building could be clearly seen.

The intercom was directly in front of the window.

Bennington seated himself and turned the intercom switch to Message Center.

"This is General Bennington, the warden of this prison," he said clearly. "I am in the kitchen office. To show my confidence in the fact that we can arrange a bargain, I am turning on the light in this room. You will be able to see me clearly."

"No!" broke out Thornberry, staring at Bennington.

"Turn them on," said Bennington.

Thornberry hesitated for a heartbeat, obeyed the order. Then, moving with deliberation, he seated himself beside the general.

"This is Musto," came from the intercom. "I'm boss over here. You've got guts, Bennington, I've read about you. But don't forget, two of my boys have you and the other guy on line down the sights of their rifles. Any sign of something screwy, and you two get it first."

"There has to be mutual trust for any kind of bargaining," Bennington replied. "This is mine, right out where you can see it."

"O.K. Now, first, get that copter off the top of this building."

Musto spoke with the assurance that his order would be obeyed.

"Go to hell," said Bennington easily.

"WHAT!"

"That copter above you, and the Army battalion that will be here in a few minutes, are for me what those rifles you have aimed are for you. You can knock me off, sure. But how long are you going to live to enjoy the thrill?"

"Well, I'll be—" and Musto described his relationship to a female dog.

"I can't confirm or deny your opinion of yourself," Bennington said, and forced himself to chuckle. "Now, let's get down to business. What do you want?"

"Pardons. For all of us. For all crimes."

Bennington whistled. "That's a big order. And in return?"

"Your staff stays alive."

Flatly. There was no question Musto meant what he said.

"That means I'll have to talk with the governors of six states," Bennington temporized.

"That's your worry."

The general sighed. "All right, you've got Message Center. Connect this phone with the outside. Remember, this is going to take a while."

"That don't worry us, general. Add up how much time we've got coming due over here. It's all you need and then some."

Bennington lifted the phone on the desk and waited. He could see an irregular flickering, like a cigarette lighter, in the Message Center Room. Then the familiar buzzing sounded in his ears.

Once more he dialed "0". "Operator? This is Warden Bennington of Duncannon Prison. Please arrange, with top priority, a person-to-person conference line with this prison and the governors of Pennsylvania, Delaware, New York, Maryland, New Jersey and Connecticut. Yes, call me, when the connection is completed."

"And don't forget, we'll be listening," came simultaneously from the intercom and the telephone.

"I expect you to," Bennington said promptly and hung up. At the same time, he switched off the intercom.

He leaned back in his chair and, for the first time in years, found himself aware of a long-forgotten feeling. The center of his forehead tingled as if it were being brushed by a silky feather.

He knew the sensation, had felt it before. Someone had a gun on him. And that someone was a mere thirty yards away.

The general turned his chair toward Thornberry, felt that feather tingle along the nerves of his scalp. The psychologist was sitting stiffly erect, his hands firmly clenched together in his lap.

"Tell me what happened after I left you," Bennington said. He kept a wary eye on his assistant warden. The man seemed in the civilian equivalent of battle shock.

Thornberry sat at attention, as if he were delivering a formal report. "The guards lined up the prisoners in columns of twos and marched them to the mess hall. There they split the column. The left half went to the south door, the right half went to the north door. I followed the line to the north door. They seemed to be piled in fast. When most of them were in on my side, I squeezed by the rest and went to the back of the hall. Rayburne and Householder, of course, stayed outside."

Thornberry's hands were slowly unclenching. Telling what happened seemed to relieve his tension.

"Both lines moved quickly, except for the last man in the south line. I thought he seemed to be dragging deliberately so. And for some reason or the other, all the prisoners—even those at the tables, except the drugged ones, hadn't started eating—watched him. But I could see no reason for alarm.

"I was at the back and the two guards, with their guns, were at each door. There was a counter between the prisoners and the kitchen, and, most important, these men had been conditioned or drugged. Then the one who was dragging got to the coffee urn with his tray."

Thornberry shivered and then slumped in his chair. "It was the most shocking thing I have ever experienced because what happened was against everything that I have ever learned. Those conditioned men in the mess hall went mad. Before the guards could fire more than a couple of shots, all the conditioned ones had thrown their trays at me, at the guards, or the people behind the counter, and then started scrambling across the counter. In a moment they were so mixed up with our kitchen personnel that the guards didn't dare do any more shooting. And just as suddenly as it had started, they were gone. Except for me and two guards, everyone else in the mess hall was either dead or dying, or one of the drugged men."

Bennington lit a cigarette and wished that he had one of Ferguson's stout drinks.

"Let me get this straight. They threw trays at you and the guards, right? But nothing more. That is, they didn't run toward you?"

"No, first the trays and then directly over the counter into the kitchen and out its two back doors."

"In other words, they knew where they were going."

Thornberry's face showed sharp surprise. "Why, yes, they did. They did seem to have a purpose, a definite sense of direction in the way they left the mess hall."

"For once I must completely agree with one of your statements, Thornberry. As soon as we can, we've got to get hold of Judkins, but we can't do it from here, dammit."

"Tell me who he is and we'll get him for you," a voice whispered from the floor.

Though educated in different professions, both Bennington and Thornberry had been well trained in the value of not showing astonishment. Out of the corner of his eyes, the general could see a uniformed State trooper lying flat on the floor. The head lifted, Bennington recognized Trooper Forrester.

"This is your party," the corporal continued. "How does the entertainment shape up?"

"We've got to keep the customers happy," the general said, "by making them think that the main show is just about to start."

"While you figure out some way to take them before they start throwing rocks at your supporting cast. Right? Well, Life Can Be Beautiful and I wish it would start right now. What can I do?"

"Get in touch with the governors. All of them. New York and Pennsylvania and the rest. Tell them that when they talk to me, they have to pull a good legitimate stall. Maybe they can refer to the laws they operate under. They might have to get an opinion from their attorneys general. Anything, as long as it sounds good."

"Can do. Will do. And after that?"

"A good question, Corporal Forrester. We'll discuss that after the break."

From the floor, a low laugh. "I had a year at the Fort Benning School for Infantry Boys, sir. Oh, how about this Judkins?"

Thornberry took over with an exceedingly accurate description of the wanted Judkins and his probable habits.

The corporal gave a low appreciative whistle. "With that we'll have him in a couple of hours, sir.

"I'll let a man outside this door on his belly like I am. By the way, we *are* in touch with the army. We're set to guide them in. Good luck, sir."

Bennington and Thornberry looked at each other.

We'll need more than luck, Bennington thought.

In the middle of his next cigarette, Bennington heard a familiar voice speaking outside the office door.

"When can I start shooting, Jim?"

"Mossback!"

"In person." A low laugh. "Wish the men you taught cover and concealment could take a look at you now.

"Here's the situation, Jim. I'm deployed in a looping L around the Administration Building. Your prisoners in One and Two have been moved out under guard into the open space beside Number Four where my copters dropped.

"The short end of my L touches the moat near your house. And by the way, Ferguson is all right. We relieved him. He says three prisoners tried to get out, but he thinks he got one of the three.

"The long end of my L goes just far enough toward Barracks One so that we won't be shooting each other."

"For a change, I didn't hear your copters come in, Mossback."

Another laugh, touched with pride. "Jim, for once, the Army is ahead of the civilian population. Our new jobs are even quieter than the night mail delivery for the suburbs. I put a squad on the roof of the building."

"*You did?*"

"No hopes, Jim. Doesn't mean a thing. I've had the report. But listen, I've got a civilian here who may be able to help."

With Mosby's words Bennington had felt his hopes rise, fall, and rise again. "Tell him to start talking."

"Slater, sir."

Bennington choked down his first words.

"I know what you were going to say, sir, and I deserve it, but this time I think I can help."

"How did you find out about this?"

"I was in a squad car on a drunk and disorderly charge. The story came over their radio. They brought me here."

"All right, go ahead."

"General Mosby was smart, sir. He brought along some sleep gas."

"So? Not surprising." Bennington knew sleep gas was standard precaution for riot control.

"The mess hall is the center of the compound. Because of that, in its cellar are the furnaces which heat the other buildings."

"What does that mean?"

"You have a forced-draft, hot-air system here, sir—"

The telephone rang, the intercom spoke. "Warden, those governors are on the line."

"Our only chance," Bennington said, "and now is the time. They'll all be listening to this phone call over there."

He hoped the man with the rifle trained on him was very susceptible to sleep gas.

"Jim, you haven't lost your touch with a pistol." General Mosby pointed to his meaning with the toe of his boot. "But you'll need a new carpet in your office here."

Bennington glanced at the three dead men, the broken window, and added them to his mental list of things to be done. But he put them among the minor problems; he had enough major ones already.

The news services were besieging The Cage. A couple of ambitious photographers had been caught attempting to cross the moat. The civilian dead in the mess hall had to be identified and the next of kin notified. His entire staff was disorganized: Imprisoned as hostages, knocked out along with the rioters by sleep-gas, brusquely revived by Mosby's aid-men—Well, he *might* be able to get some work out of them tomorrow.

The rioters still slept, but what to do about those supposedly-conditioned men when the gas wore off. . . a new hypno-tech, from somewhere, by tomorrow morning.

Add six governors who think I have nothing to do but tell them every detail, he thought grimly.

"You had better eat, sir."

Ferguson, with a gigantic sandwich and a mug of coffee.

Bennington abruptly realized that he had not eaten since noon. Then, in the middle of his second bite, he was aware of still another problem.

He swallowed hastily. "Mossback, did you bring the entire battalion? Are you completely set up for independent battalion operation?"

"Yes, of course. Why?"

"I've got a compound full of prisoners and a staff to feed."

Mosby turned to his side, but the captain has already started for the door. Mosby swung back to Bennington, rubbed his hands together gleefully. "Better and better. Just as if we had captured and had to use an enemy installation. Prisoners to guard, dead men and a couple of wounded to take care of. . . Jim, I can't thank you enough."

"You're welcome, but how long can I keep you?"

Mosby sobered. Like all good general officers, he was acutely sensitive to the political significance of his actions.

"We can get away with what we did tonight, Jim," he answered slowly. "But well, you know how the states have become the past couple of years, since they started forming regional groups.

"Wait a minute! You get prisoners from six states, don't you?"

"Yes."

"You can have the whole command. And if the AG's office can't dig up at least six good precedents for my decision, we can always let slip the story of the hula girl and the hot cigarette butt. I may do that, anyhow. I always did think he went too far to get good pictures."

"I may need more," Bennington said soberly.

"What you need, you get, Jim, but why?"

"Two of them got away."

"Yes?" Mosby was interested, but not especially so.

"One was a very good escape artist—guy called Dalton. *Harry Dalton.*"

"Um, yes," Mosby interposed, "I recall that name. If I were his commanding officer, I would call him 'Always AWOL'."

"The other was a fairly young man named Clarens."

A silence grew. At last Mosby spoke, "I've heard of him, too. How did they get through the road blocks?"

"We had to use everything." The tired man standing at the door was Corporal Forester. "We used even trainees from the Academy, and those two must have gotten out of here as soon as the riot started.

"There was only one checkpoint between here and Harrisburg and the truck looked legitimate, full of clothes picked up around the countryside. There seemed to be only one man in it and he was a sort of everyday-looking fellow."

Bennington remembered his own impression of Dalton.

"I can't blame the trainees, Dalton's gotten by better men than they are yet," the corporal continued. "And they were looking for desperate criminals, not for someone in a cleaning company's uniform who asked, when they stopped him, if they wanted some work done."

"Anybody been killed yet?" Thornberry asked.

Forester was a long time answering. "Not yet, doctor. But a man answering Clarens' description bought six steak knives near the railroad station tonight."

"Six steak knives?" Mosby asked.

"Yes," Forester answered. "Clarens and Dalton split the money the cleaning man was carrying."

"How do you know this?" Bennington asked.

"Dalton gave himself up," Forester answered. "He wanted nothing to do with Clarens when the boy started eying the knives."

"We've got to get to Harrisburg," Bennington said, "and the first thing we've got to do is to find Judkins."

"If only our files had not been shot up when the cons took over Message Center," Thornberry worried, "we could have gotten in touch with his sister-in-law."

"No," said Bennington and Forester together.

"No," agreed General Mosby.

The two generals looked at each other, then at the corporal.

Forester took the cue. "I think it's a planned job. The riot, that is. Someone wanted to disgrace you the first day you took over, general. Or, listen! This may be it: they wanted to be sure that someone here in prison didn't talk. I mean—" The trooper rubbed his hand across his forehead. "Thought I had something there."

"I think you do," Bennington said, "but first things first. Let's find Judkins. Then Clarens."

"We'll fly down," Mosby decided. "And let's do something I always wanted to do. We'll land on the Capitol grounds. Give me your phone, Jim. We will need more than the battalion I brought with me."

"And it's upstairs, ready and waiting."

Considering Harrisburg from above, Bennington decided the town, as a tactical problem in setting up patrols, offered unique difficulties. The way those railroad yards stretched up and down each side of the river . . .

The riot-control copter had moved ahead of them and was their guide to a relatively clear spot among the trees dotting the Capitol grounds.

Three dignitaries awaited their arrival, Governor Willoughby, Mayor Jordan and Chief of Police Scott.

"This way, sir," said Scott, elbowing aside the other two. "Formalities can wait, we've got work to do."

Introductions were performed on the way to another grove lanced with searchlights. A photographer was busy over the body of a middle-aged man.

"Some folks you can't tell anything," Scott said, "and especially when they're in heat. We never had any complaints about this guy, but we knew what he was. I myself told him that someday he would pick up the wrong man.

"And he sure did this time," he added unnecessarily.

Corporal Forester squatted beside the body. "He was kneeling, grabbed by his long hair, head pulled back, one good slash did the rest."

"Real nice slash," General Mosby agreed professionally. "I'd like to show that to some of my men." He pushed the head back so that the cut across the throat was more clearly visible. "Just one swipe."

"Clarens was a pre-med student," Thornberry stated.

Bennington noticed that his psych-expert had kept his gaze fixed on the trees after a glance at the body.

"No idea where he went from here, of course?" Mosby asked.

"None," Scott admitted, "but I've got patrols out."

"I've got another battalion upstairs," Mosby remarked, jabbing toward the stars with his thumb, "and the rest of the regiment on the way.

"You know this town. Tell me how you want them distributed."

"I'd like to." Scott meditated a moment. "But, I can't. I can't even swear them in. They're Federal troops."

"I've just declared martial law," Governor Willoughby emerged from the shadows.

"Thanks, sir." Scott looked like a man with a weight taken from his shoulders. "We'll need cars, of course.

"But we can stop them on the streets. Then have our men drive them home. With your help, General Mosby, we can cover this town like a blanket."

But the blanket was too late to stop the second murder.

The report came in after they had talked to Dalton.

"That's why I gave myself up," the convict said. "I wanted no part of that guy, so I figured my best alibi was a nice, quiet cell."

"How is Clarens dressed?" Scott demanded.

"He picked a double-breasted blue suit from the racks in the truck. Fitted him good, too."

Scott strode into the next room and through the open door Bennington saw the Chief of Police pick up a mike.

"This is important." Thornberry, intent, looking like a lean hound on a hot trail. "*What were you told when you were conditioned?*"

"I don't remember." Dalton was plainly baffled. "I just don't remember. Something about when a guy threw his tray . . . You got me, I don't know."

"All right." The psychologist tried another tack. "What made you leave the others and take Clarens with you?"

"I didn't take him with me." Dalton's voice was weary, edged with anger. "I remember sitting down under the hypno-hood in The Cage. From there on, things are mixed up. I think there was running and yelling and that I ran and yelled, too.

"Then I came to and I was in a building with a lot of guys grabbing guns."

"I should have predicted it," the psychologist said, "that he would be commanded to forget what he had been told while under the hood."

"Can't you remove the block?" Chief Scott had returned in time to hear the last words.

Thornberry pursed his lips, then said, "It would take a very long time. Remember, I know Judkins, I interviewed him and watched him work before we hired him. He is a very, very good hypno-tech. And there's no machine anywhere near except at the prison.

"Let's hear the rest of his story. Go on, Dalton."

"You know my record, guns aren't for me. So I looked around and saw a busted window. This Clarens and another guy—a big fat one—had sort of stuck with me. I guess they didn't like guns either. When I went out the window, they were right behind. Clarens and I ran real fast. The fat guy behind us tried to run as fast, but he wheezed too much.

"Somebody lying on the edge of the moat cut loose with a subgun and Big Belly went down. Then Clarens and I were in the water. The other cons back in the building started shooting at the guy with the subgun. I guess he got too busy ducking to give us any more attention. Anyhow, he didn't swing any tracers after us.

"We ran across a couple of fields, toward Duncannon, and spotted a guy pulling a delivery truck into a farm lane. We sneaked in, found a wrench. When the driver came back, I gave him a gentle tap. Clarens and I stripped the fellow, tied him up and shoved him in one of the big baskets in the truck.

"In the uniform, it was a cinch to fool the troopers. They stopped us only once on the way into town. When we got there, I switched again from the driver's uniform into one of the suits from the racks. We had it made, hands down."

"Why didn't you turn Clarens in when you gave yourself up?" Scott demanded angrily.

"I tried to. Remember, I didn't know who the guy was until after we had looked in the railroad station and seen it full of cops. But when he started admiring the steak knives in the window, his name clicked with me. I said to him, 'I've got to go to the little boy's room—I'll be back in a minute'. I found the nearest cop and turned myself in, but I couldn't make that thickhead believe there was a worse one than me down the street. At least, not until Clarens had got the knives and taken off."

Bennington wondered if he had ever heard anyone speak with such deep disgust.

The call which took them to the Camp Hill area justified Dalton's condemnation.

The hysterical mother had been led away by a couple of consoling neighbors. Bennington, Scott and Thornberry stood looking down at the neatly dismembered body. Behind them General Mosby spoke to three of his soldiers.

"Good work, men. Keep it up and get back on your beats. You know now what you're hunting for. I'm sure you'll hunt even harder."

The slapping sounds of rifles saluting, the click of heels, the scrape of boots in an about-face and a scrap of conversation floated to Bennington, "Any mother who lets a kid out as late as this . . ."

Mosby joined them and picked up where the soldier had left off. "How did it happen, Scott?"

"It's hard to get anything out of the mother right now," Scott replied, "but I got this. They were waiting up for the father—he's on the swing shift—and the kid wanted ice cream. The store's just around the corner and the mother was busy ironing, so she gave the kid a quarter."

The chief of police turned away from the body, turned away from the lines written in blood on the wall—"PLEASE CATCH ME QUICK". He went to his car and switched its radio to one of the local stations.

"Stay off the streets. If you are in your car, do not stop for anything except—and listen carefully—at least three men in army or police uniforms. Do not stop for any man standing alone. Do not leave your home except on the most essential business. If you must leave do not go alone. Repeat: Do not leave the house alone . . ."

Scott switched back to the police band. "What we just heard is on every radio and TV station covering Harrisburg."

Another police car drifted into the alley, emptied men and equipment.

"We can go," Scott said. "My men will take care of the routine."

All of them were silent as they crossed the Market Street Bridge into the central section of town, deserted except for police and army patrols.

"Belton Hotel," the radio squawked, *"Judkins has been picked up at the Belton."*

"Now I'll find out what he has told them," Thornberry exulted, "and then we'll have no trouble finding Clarens."

"You know my name, you know my present address, and I'm not saying any more until I see my lawyer." Judkins had been saying that for half an hour and his words had not changed.

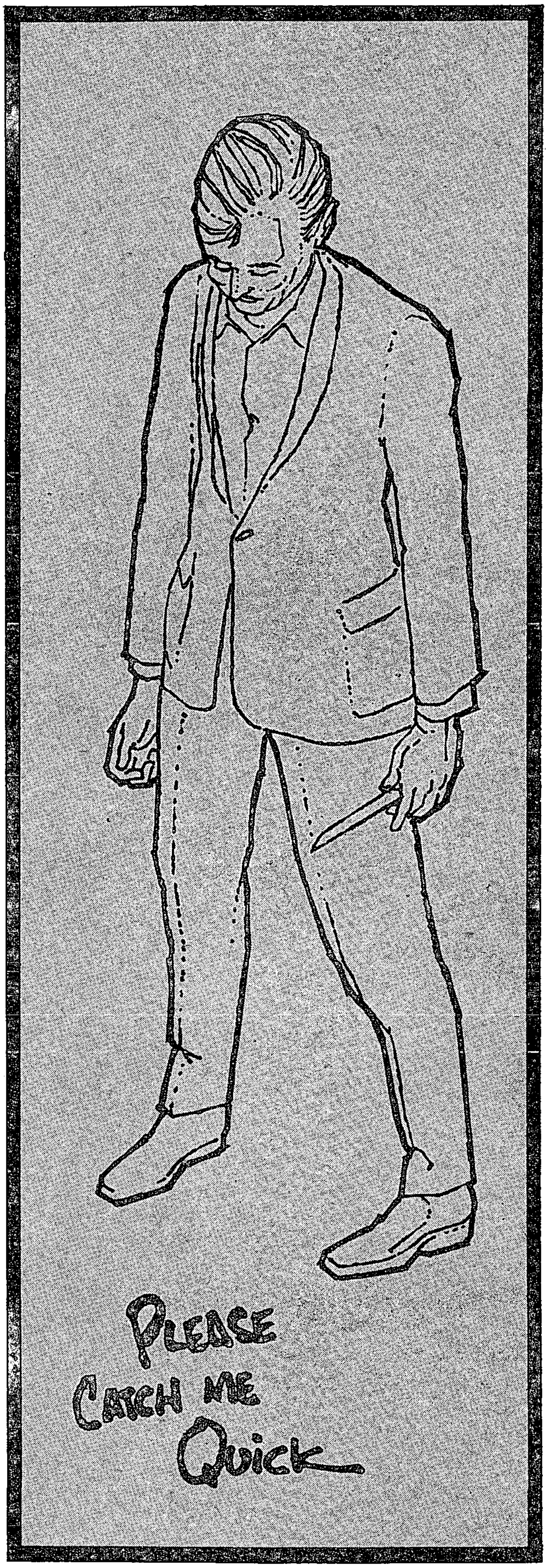
Mosby tugged at Bennington's sleeve. Together they moved to a corner of the hotel room, and at Mosby's nod, Scott and Thornberry joined them.

"Get out of here for five minutes. When you come back, he'll be glad to talk.

Mosby wasn't joking.

"I want to do the same thing," Scott said bitterly, "but I can't do it."

"You're under civil law." Mosby stated. "This town is under martial law. I might be able to get away with it"



"Not a chance," Governor Willoughby had joined them. "It would mean your career, general. Even the President couldn't protect you."

"Clarens is out there," Mosby argued, pointing out the window overlooking the city. "Did you see that little girl?"

"No, but I heard about it. And I saw the man," the governor answered.

"I was there," said Thornberry abruptly. "Will you gentlemen let me, *just* me, alone with Judkins for five minutes?"

All four of them, the two generals, the police chief, the governor, stared at the psychologist.

"Yes," Bennington decided for the group. "We will."

Doughboy . . .

Bennington stopped after his first step back into the room, was jostled by Mosby following closely behind. He moved forward to where he could see both Judkins and Thornberry.

The hypno-tech sat bolt upright, his face like that of a newly-conditioned prisoner, completely blank.

Thornberry's face radiated pride.

"These technicians are all alike," the psychologist sniffed. "Their work makes them especially sensitive to hypnosis."

Bennington looked at Judkins, then back to Thornberry. "You mean . . ."

"I mean that I can ask Judkins anything we want to know and he'll give a truthful answer." Another sniff. "I've forgotten more about hypnosis than he'll ever know."

"This won't hold in a court," Chief Scott warned.

"But it may save a life, maybe more than one," Bennington answered. "Thornberry, you did a good job of those guards. You question Judkins."

"Wait a minute," General Mosby said. "How fast can we get a tape recorder?"

"Why waste time?" asked Bennington. "You can't use this in court."

"Hell, Jim, stop thinking about courts-martial: there's more than *one* court. Let's fry these boys in the court of public opinion. The news services aren't bound by the rules of evidence. We can worry about other courts later."

"I can get you a tape recorder in two minutes," Scott stated. "Our patrol boys always carry them to take statements at accidents, before the victims get over their shock enough to start lying. And we keep one in the office, too."

Thornberry looked at Judkins and a self-satisfied smirk crept over his face. "No need to worry about lies from this one."

Judkins spoke in a low monotone not much louder than the soft hiss of the machine recording his words. Question by question—in Judkins' condition, each query had to be specific, Thornberry said—the pattern emerged.

Basing his request on his position as a member of the prison commission, Senator Giles had invited Judkins to lunch with him. The senator, however, despite his statement that he wanted only to be sure that Duncannon was getting the best personnel, had not confined his questions to Judkins' background.

Was the hypno-tech alone when he conditioned the men? Any set statement to be made? Could Judkins add to the instructions given each convict without the knowledge of the prison authorities?

The following day, both Senator Giles and Representative Culpepper had called upon Judkins at his sister-in-law's home. Bluntly, they offered ten thousand dollars if the technician could guarantee that Rooney would never be able to talk about the income tax racket.

When Judkins had explained that any conditioning he could give would be as easily removed by another tech, the two men had gone into a corner and consulted in whispers.

They had emerged from the corner with this offer: First, they would bargain with the new warden to get Rooney a job as a trusty. If that failed, they offered Judkins twenty thousand dollars and a hideout in New York—until they could set him up outside the country—if he would condition a group of prisoners to riot and discredit Bennington immediately.

"What Rooney must be sitting on!" Mosby murmured in Bennington's ear.

"Was sitting on," Bennington said bitterly. "He was the fat belly with Dalton and Clarens, the one who didn't make it."

The story flowed on under Thornberry's skillful questioning.

At noon yesterday, a frightened and angry Giles had called Judkins, had boosted the bribe to thirty thousand and demanded immediate action.

"What did you tell the prisoners?" Thornberry's voice was as even as Judkins'.

"I was their friend and their only friend; every one else was their enemy. I told them they must be quiet and obey all orders until the last man received his coffee in the mess hall. They were then to throw their trays at the people around them. I told them where to go for guns. I told them that then they would forget all that I had said, that they would know how to take care of their enemies."

"Gentlemen, do you realize what this means, in terms of the constitutional psychopathic inferior? I refer to Clarens, not Dalton. Dalton reacted as Judkins directed, including to forget that he had been told everyone was his enemy. Dalton, we know from his record, actually disliked to use weapons even as a threat.

"But we can be sure that Clarens has not forgotten."

"Why not?" Mosby demanded.

"Because the instructions he received only intensified what he himself believed before Judkins worked on him.

As soon as he had a chance he looked for his kind of weapons. How he got her there, we won't know until we catch him, but note that he killed the little girl in the equivalent of a cavern.

"And the man in the park, that, too, took place in what was necessarily an almost secret spot.

"Those orders Judkins gave, we *know* Clarens is still responding to them . . ."

Thornberry hesitated a moment, then completed his thought. "And so we must intensify out patrols on the darker streets. With this poor boy believing that every man's hand is turned against him, he is now looking for some dark place in which to feel safe. He is in essence retreating to the foetus—"

"Sounds good, but tell me the rest later, Doc."

"General Mosby, you and I want to call our roving patrols," and Scott headed for the door, Mosby right behind him.

"By the way, Doc," the chief called back over his shoulder, "when you're done with that guy, just tell one of my men. We've got a special, reserved, very solitary cell for him."

More slowly, Bennington followed Scott and Mosby.

The area of the hunt had perhaps been narrowed. Their quarry—the beast with steel knives for talons—would be found in a dark, deserted place.

Bennington noted that Thornberry stayed with Judkins for about ten minutes before he joined the group around the map of Harrisburg in the Operations Office.

Personally, the warden was glad that his assistant was not present; the discussion would almost certainly have produced an explosion from the psychologist.

Scott began his gloomy analysis after both he and General Mosby had redirected their patrols to heavier concentrations in Harrisburg's dim-lit and winding side streets.

"I hate to hunt this kind," the chief said gloomily. "You just never know, never know anything, except that they're going to kill again.

"I just hope he has cooled off and that he wants to sleep a while."

Bennington noted with amused interest the startled glance General Mosby gave the Chief of Police. Mosby's greatest strength and greatest weakness, both in the field and garrison, was his complete refusal to accept or excuse aberration.

Scott had caught the glance, too, and continued. "I got a good lab, general, smart boys willing to pull extra duty. They've already told me that Clarens reached—after he killed the guy in the park—an emotional climax."

Bennington watched his former Division Commander's face harden as expected.

Scott continued: "That's why I said, I hope he's cooled off, wants to sleep a while. Every place he can get a bed in my town, I'll know the minute he wants to lie down.

"Then I'll take him, like this"—the big hand crushed upon itself—"dead or alive, and I hope I have to take him dead."

"Why *dead?*"

"General, sorry, *warden*—no, I'll go back to the way I know you best—General Bennington, Clarens simply isn't the business of any kind of normal living.

"You take a guy who cracked a safe, knocked off a payroll, robbed a bank, he's like any good business man taking a risk: he has insurance, he's got an out.

"He can buy me, he can talk to the D.A., he can get the court to go along if he's caught. He just says, I'll tell you where the stuff is if I get the minimum.

"O.K., we're wrong, we should go black-and-white, we should say no to any kind of deal, I shouldn't let a little guy go just because I'd rather grab the big one. Only, unconditional surrender doesn't work any better in my job than it does in yours on a battlefield."

"We've learned it doesn't work too well," Bennington agreed, "but what has this to do with Clarens?"

"General, you did the right thing up at Duncannon when you decided to talk to Musto. He was a man in business, with something to buy and something to sell. He could be dealt with.

"Now think this through: Suppose everybody in that Administration Building had been a Clarens. And I heard that you said this, General Bennington, that there has to be some sort of mutual trust for bargaining. You could deal with Musto because he is, and I'll make the point again, a sort of business man even though his business isn't legal.

"But Clarens . . ."

Chief Scott let the silence build while he lit a cigarette.

"But Clarens wants to be caught," Mosby said.

"He does?" Chief Scott pointed to the map. "General Mosby, you and I both know that all he has to do is sit down on the curb underneath any street light.

"Let me change that. We would have him ten minutes faster if he sat down on the curb of any dark street.

"No, he doesn't want caught, except maybe those first couple of minutes when he's almost human, those first couple of minutes after he's killed somebody. And if you have to kill someone to have human feelings yourself—that's not for most of us and that's why I hope he fights back and I have to take him—dead."

Chief Scott turned back to the map of Harrisburg. His forefinger ran down the river, pausing at each of the many bridges. Then he turned to the generals.

"Maybe we've got him pinned. We've had the bridges sealed tight and if Dr. Thornberry is right, he won't chase west because Pennsylvania land, especially around here, is selling real high and that's still very open country.

"And that's not for Clarens, he wants back into our little city, back where things feel close and he feels *inside.*"

Bennington found himself looking at Mosby, with the glance returned.

Mosby spoke, reluctantly. "He could be through us, Chief Scott."

"*How?*"

"The same way my men come back to camp and it's a natural way that's rarely stopped."

"Clarens had no military experience!" Scott said.

"No, but he's read a lot—that came out at the trial—and he's under pressure, so he'll remember what he read," Bennington said.

"Tell me this way you can walk invisible across a lighted bridge," and Scott was still unconvinced.

"You don't walk over, you ride over," Mosby said. "I would work it this way.

"I would stop in a bar and buy a drink that made me smell five feet away. I would order and get rid of a couple more of them, very quickly, then I would tip the bartender to call me a cab.

"And by the way, of course I wouldn't be drinking any after the first one.

"But when the cabbie came, I'd offer him a drink, wave a big bill or two that meant a good tip, and give him a good address—for instance, the hotel that takes up the biggest space in the yellow pages of the telephone book.

"I would get into the back seat of the cab still holding on to the biggest bill or two out of those we took from the cleaning truck and I would pretend to fall asleep.

"With that cab driver convinced that he's hauling a drunk just aching to give away a big tip—and any normal human being perfectly sure that a wanted killer would never walk into a bar, get loaded and order a cab to take him to the biggest hotel in town—what are my chances, Chief Scott?"

The chief did not answer directly. Instead, "And I'll bet he wins that appeal he's got going, too."

"What did you say, Chief Scott?" Bennington asked.

"We got the word a while ago from Delaware by teletype. Clarens has three good lawyers fighting an appeal from the conviction on every grounds you can think of, including that the confession was beaten out of him.

"That's why I hope he wants to fight when I catch up with him, and that's what Delaware hopes, too.

"But here comes Dr. Thornberry, General Mosby. Let's ask him why Clarens hides so well when he says he wants to be caught."

Thornberry pursed his lips so tightly that his face became a skull's head, then he answered.

"In some areas of human behavior . . ." he began.

"Dalton," Bennington interrupted, "does he make a game out of getting away when he's caught?"

Thornberry's face became almost human with a big smile. "Oh, yes, obviously."

"Could that energy he puts into escaping be channeled, led, educated—in some way—to constructive thinking? Put it this way: could Dalton be led to thinking about making a jail escape-proof?"

"A most excellent therapy," and Thornberry was actually beaming. "General Bennington, I am beginning to have great hopes for our work together as we start to see more and more eye to eye."

"Let's go back to Clarens," Bennington said. "Son of wealthy parents, a good education, the only child in a family who seemed to have everything, including parents who loved both each other and the child—why does he kill, ask to be caught, and then hide so well?

"What therapy does your science have for him, Dr. Thornberry?"

Thornberry's lip-pursing again made his face a skeleton's.

"There are areas of human behavior—"

Bennington observed that Scott and Mosby had turned away from the conversation to the immediacies of patrol distribution. Scott was being eloquent on how lighting cut down crime and Mosby was analyzing the idea in terms of house-to-house combat at night under slow-dropping flares.

For further insurance of privacy, Bennington pulled Thornberry into the corner of the room most removed from the others.

"Doctor, let's forget about Clarens for a moment. I want to talk about Judkins."

"Yes, general."

"How did you hypnotize him? And don't hand me any of that stuff about him being sensitive because of his job."

Thornberry smiled. "You've seen too many conditioned men, and in a way I'm surprised that I got past Chief Scott with my . . . General Mosby should have been more alert, too.

"You're right, it was his skin, not his job."

"I'm still puzzled."

"I won't go into the physical structure of the man, his character as revealed by his choice of profession, and so on. Briefly, he is hyper-sensitive to the thought of physical pain, that's all. So I gave him a simple choice. Talk to us in such a way that what he said could never be used against him, or go for a ride with you, Chief Scott, and General Mosby.

"This is very odd, a fact I must further check into, that your name frightened him most."

"*You* threatened someone with violence!"

Thornberry sniffed. "It was no threat. I knew the man and simply appealed to him in the proper way. Then with the spray of cannabis indica that I carry, I speeded his willingness—"

"Marihuana!"

"Please don't be so shocked!" and Thornberry was horrified that Bennington should be shocked. "The prescription I use is a carefully compounded medical dosage specifically prepared to promote suggestibility . . ."

"Doctor, I am not in the least suggesting that you would use any method or drug not thoroughly commended by your profession.

"In addition, I am delighted beyond expression that you found some way to learn what we needed from Judkins.

"But, just as I was surprised that your profession did find a use for a drug previously condemned, I now want to be surprised in another way:

"What can you do for someone like Clarens?"

Thornberry's lips came together and his cheeks began to pull in. Bennington resigned himself to hearing again the phrase, "There are some areas of human behavior—"

"Car 17, at M dash 9, Code Two Zero, times two. Standing by for instructions."

Bennington turned to watch Chief Scott's big forefingers travel a line from the side and a line from the top that brought them together on the big map. "Signs of breaking and entering, down on Hickory, where it's all big warehouses."

Thornberry leaped to the chief's side. "Lonely at this time of night? Dark? Not too many people?"

"Right on every count," Scott said. "Only a few night watchmen."

"This should be carefully checked," and Thornberry started for the door.

Scott turned to the dispatcher. "Tell them just to keep the place under observation until I get there."

There was an odd eagerness about the chief, odd until Bennington remembered Scott's grim analysis of Clarens' behavior, the chief's hope that Clarens would resist arrest.

And why do I now recall that time in Burma when I followed the wounded tiger into the cave?

What was I thinking of at the time?

Thornberry had disappeared into the corridor, but for once even the prospect of immediate action was not enough to get the impetuous Mosby out the door ahead of Scott.

Was I thinking of mercy, that I could not let a wounded beast which could not destroy itself live with continual pain? Thornberry would never agree, but Clarens is certainly both wounded and incapable of self-destruction.

Thornberry was already seated in the back of the car, Mosby was ready to seat himself in the front, Scott was opening the door to slide in behind the driver's wheel, but Bennington did not change his steady pace.

Retribution and punishment, because the tiger had killed human beings? No, no and never no, for these are worthless without understanding by the person upon whom they are visited. A baby understands not the reason why but only the whack across its buttocks when its fingers or its life are in danger, and that action is thence forward 'reject'; but Clarens is not a baby and a baby is not a tiger, with all three having only this in common, that 'don't do this' is a mystery . . ."

Bennington seated himself beside Thornberry in the rear of Scott's sedan, more aware of his thoughts than his movements.

For a moment the whine of the turbine was high, the gleam of the headlights low, then they were on their way.

Hickory Street was a fast three-minute run from the police station.

"Nothing but warehouses," Scott said. "We're a big trans-shipment center."

The narrow, one-way streets and the broad-shouldered bulk of the big buildings emphasized what the chief had said. The railroads and the rivers were still the most economical way to ship the space-taking stuff, coal, steel, grain. Harrisburg was a crossroads where the east-west and north-south main lines met, with a natural growth of the long warehouses at the intersection.

Scott spun the driver's wheel to the left and cut the car lights. "Hickory Street."

It is a lonely place at night, Bennington decided.

Thornberry leaned forward from the back seat of the car, leaned forward so far between Scott and Mosby that his thin nose almost touched the front window.

"Ideal, ideal, just the way Clarens would be thinking."

"Thank God we found Judkins," Mosby said, "but say, that reminds me. Why didn't he take the first plane or train out of town? He had plenty of time before we knew we wanted him."

Thornberry pulled himself back, re-condensed his lean frame in the left corner of the back seat. "He was waiting for Senator Giles to pay him off and tell him where to hide out."

Chief Scott idled his car to a halt beside another dark-blue sedan almost invisible in the shadowed street.

A figure loomed large in the shadows, came forward and identified itself.

"Patrolman Whelton, sir, and Sergeant Kerr is in the back."

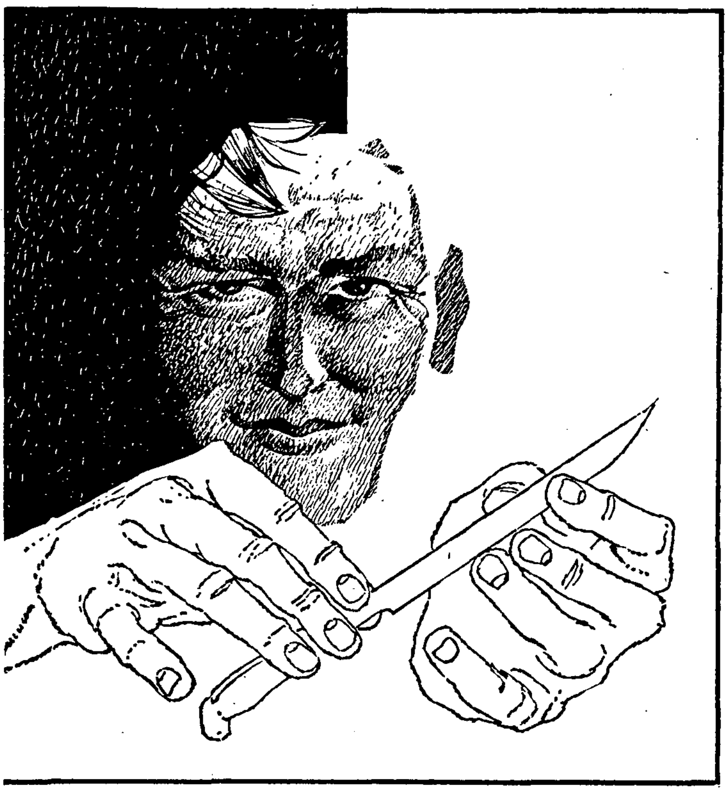
Somehow Scott managed to return the salute while at the same time disentangling himself from his seat-belt and from behind the driver's wheel.

"What did you spot?"

"According to orders, we were riding the alleys and we saw that the window had been broken since our last inspection."

They were in a tight group around the young patrolman because Whelton had spoken in a soft, church-going whisper. Now Mosby walked away from the group, thoughtfully fingering the ivory-handled butts of his revolvers, but returning to the group when Scott began speaking.

"Thanks, General Mosby. They couldn't have checked the alleys as often as they did without your men helping



out on the streets. This way, we caught it fast."

"Sir, we can't find the watchman for this area," and Patrolman Whelton was very worried.

"Watchman?" Mosby asked.

"Fire-warden would be more accurate," Scott said. "He isn't here to prevent theft. The stuff in these buildings is too big to steal without a convoy of trucks that would awaken the whole town. But he does have a definite route, with fixed posts where he clocks in."

Two more cars drifted to a halt, disgorged men armed with shotguns and sub-machine guns.

Scott rubbed his chin thoughtfully, gave his orders carefully, obviously aware that he had two renowned tacticians with him.

His car and one of the newly-arrived ones were to remain in front of the warehouse. The other patrol car would pull around the block and join Sergeant Kerr in the alley. At Scott's signal, they would flood the building with light.

And not until much later did Bennington remember to laugh at the way they had all followed the elephantine Whelton's example and gone on tiptoe down the walk between the two concrete-walled warehouses, into the alley behind.

The broken window was in a small door, part of the large door which let trucks in and out.

"Nice eye," Scott said to Whelton.

Bennington agreed.

The break in the window was just big enough to allow a hand through the door, a small hand through the pane to the lock on the inside of the door.

Scott stretched out his arm to try to slide his big, freckled hand through the break in the window, but abruptly Thornberry stepped forward, catching the chief's hand in mid-gesture.

"One moment, Chief Scott!"

The chief was startled. "What's up?"

"This isn't your job, it's mine. If that poor boy *is* in there, he needs a doctor, not a bullet."

"Whatthehell—" Scott sputtered, the phrase emerging as a single word.

"Thornberry's right, Chief Scott, though he's right for the wrong reason. Clarens is our job."

Following the tiger had been a simple act of necessity in two ways. To rid the tiger of the pain it could not remove from itself and to rid society of the menace the beast had been and would continue to be until it was destroyed.

With his words to Scott, with that last thought, Bennington shook the lethargy, the stillness of deep thought that had contained and enveloped him since the report of this breaking and entering.

Now, as in that dash to the mess hall, he was ready for the fast sprint, the decisive action.

Before Scott could answer and possibly object, Thornberry had taken the flashlight from the chief's hand, was fumbling through the open pane for the lock inside.

"Give me a flashlight, too," Bennington said.

Patrolman Whelton responded.

At the same time, Mosby reversed the grip on the pistol in his right hand and offered the ivory butt to Bennington.

"What do you think I am, a psychologist?"

Bennington had kept his voice to a whisper, but he had made that whisper a snarl. He further emphasized that snap in his tone by pulling out his own pistol, throwing the beam of the flashlight on his hand, making both the sight and sound of the safety going off clear to the eyes and ears of those around him.

Then he followed Thornberry into the black cave of the warehouse.

Before them stretched a long aisle formed by big boxes piled fifteen feet high. Side aisles branched at ten-foot intervals.

They moved slowly, used their lights carefully, in quick flickers on and off. Each branching from the main corridor had to be approached cautiously. Each, when checked by a rapid finger of light, showed only the sides of boxes marked by stenciled words and the blank walls of the warehouse.

A flash of light, a few steps forward, another flash, a few more steps . . . until they were halfway down the warehouse.

Bennington saw it first and halted Thornberry with a touch on the arm: the last row of boxes on the left was outlined by a faint glow of light.

Together they walked rapidly, quietly, toward the glow. When they reached the end of the aisle, Bennington tried to take the lead. But Thornberry deliberately shoved himself ahead of the general and turned the corner first.

The space from the last row of boxes to the front doors of the warehouse was big enough for a truck and trailer to maneuver in. The feeble glow of light came from an electric lantern on a small desk. Beside the desk, leaning his chair against the warehouse wall, a palefaced young man sat looking down at his hands. His long fingers played with a knife.

The shadow of the desk spread across the floor and in that shadow bulked a large, unmoving blackness. Bennington flicked the beam of his light on and off quickly. One glimpse was enough. The unmoving blackness was a middle-aged man in work clothes and boots, lying on his back, with the slash across the throat standing out clearly.

"Walter."

Thornberry spoke softly, moved slowly, easily toward the young man.

At the sound of his name, Clarens looked up, his face calm and composed, his posture expressing complete disinterest in the fact that someone was approaching him.

"Walter, I am Dr. Thornberry. I am a friend of yours. I am here to help you. You need help. I am here to help you."

As Thornberry spoke, he continued to move forward slowly.

Bennington followed, two strides behind and one to the left of the psychologist. He kept his point of aim fixed on Walter's face.

"I am your friend. I am here to help you."

"You are my friend?" Walter asked, and there was doubt in his tone.

"You can be sure of that, Walter. I want to help you. I am here to help you, Walter."

Thornberry, who had stopped when Clarens had spoken, now moved forward again.

"Put down the knife, Walter. You don't need the knife any more. Put the knife down and come for a little walk with me. Come out of this dark place with me. Out of the darkness into the world where you belong. Let us take a walk together, out of the darkness into the world where you belong."

Bennington felt his own tense watchfulness relaxing in the smooth flow of Thornberry's words. Before them, Clarens' disinterest had gradually become absorbed attention. His hands no longer played with the knife, but simply held it loosely.

In another minute, he'll put down the knife and come with us, Bennington decided. Out of the corner of his eye, he saw Thornberry take a plastic squeeze-bottle from his pocket.

Without any gathering of facial or body muscle to signal his intention, Clarens launched himself from his chair. As he jumped, he shrilled hoarsely, "Not into the light again!"

Only Thornberry's height saved him: Clarens' leap could not quite reach the psych-expert's scrawny throat. But the doctor did stumble backwards, did fall on his back with Clarens on top of him.

The killer's right arm swung back. The edge of the knife blade danced brightly in the dim light.

Bennington took no chances with fancy shooting. He dropped his point of aim and his first shot smashed into Claren's chest, driving the young man back onto his haunches. The general's second and third shots were also into the body.

Then before Bennington's inner eye two scenes flashed fleetingly, one of a darkened garage, the other of an almost-as-dark jungle trail. In both the figure was a weeping mother above a child's still form. Deliberately, with three carefully-aimed shots through Clarens' head, Bennington killed the wounded tiger again.

Out of ingrained habit, he reloaded his pistol before moving forward to help Thornberry to his feet.

But the psychologist was already standing, was turning toward Bennington, wild anger on his face, in his voice.

"What did you shoot him for? Why did you kill this poor, misguided boy?"

Bennington looked at his assistant warden and saw that the man was deadly serious. Then the general looked at Clarens sprawled grotesquely on his back, with his shattered head resting against the dead night watchman's feet, with his right hand still gripping the knife.

I know seven languages, Bennington thought, with maybe knowing some of them only well enough to swear in, but right now I don't know the words to answer this man.

Bennington looked at the face reflected in the mirror in Chief Scott's private bathroom. The face was gray and lined with fatigue, needed a shave and the bristle of the beard was more white than brown.

His throat was raw from too much smoking, from answering too many questions, and a long, long day was still ahead.

Judkins was in jail, and glad to be in a solitary cell because he was handwriting a full confession. The knowledge of what Clarens had done during his few hours of freedom had scared the hypno-tech into almost incoherent co-operation.

The chief of Harrisburg's police was showing less signs of wear than anyone else. Scott was exulting in his position as supervisor of the city-search for Giles, glorying in his position as relayer of the details of the state-search for the errant politician.

Bennington opened the door into Scott's office, meditating gratefully on one blessing, that the six governors who had agreed on his appointment had also finally agreed to sleep.

Of course they had all assured him of complete concurrence with his suggested reforms for Duncannon Prison . . . but what else could they have done?

Mosby was just outside the bathroom door, standing big enough to insure a half-circle of privacy between the general and the reporters.

"Had a call from Washington, Jim. That Rooney tax mess is getting top priority."

"Good."

"The AG called, too."

Bennington found himself companioning Mosby's faint smile. "You had a cigarette in your ashtray?"

"I did, and he's got six good precedents to back us up, Jim. But the next time he wants us to call him first: my men aren't the only ones who need practical training."

Bennington did not hold back his laugh and he stretched out his hand. "Thanks, Mossback."

"Hell, Jim, I owe you the thanks. That was the best training problem my men ever had, taught 'em more in one night that they can ever learn until the real stuff starts whistling around."

Bennington glanced over Mosby's shoulder at the place he was headed for: the hot seat, Chief Scott's desk chair, bright under the TV spotlights, the center of every camera focus.

"You've got work to do, I know, so where's that Thornberry?" Mosby growled. "He should be with you."

"Upstairs, asleep. He said that he was only the assistant warden, then asked Chief Scott for an empty cell and left me."

"Why?"

"It's very simple: he's still not convinced that I had to shoot Clarens."

Mosby grunted deep disgust, looked over his shoulder toward the hot seat, looked again at Bennington. "You should have shaved.

"No, wait a minute, I guess not. Just go the way you are and give 'em hell."

Bennington rubbed his chin and the bristle of his late-night, early-morning beard crackled crisply.

The problem he had anticipated was now here, as he had known it would be. And the answer was nowhere, which equally had been a matter of foreknowledge.

"What will I say, General Mosby?" Bennington murmured. "Cue me in. You were always the best public relations officer either of us ever had."

"Jim, from anyone else—" Mosby started, stopped, grinned. "The trouble is, you're right.

"But this time we don't need any style, this time all we need is the truth.

"Tell them why the prison wasn't running right, how the riot happened and why you are where you are tonight, and what the prisons need to make them run better. . . ."

Mosby stopped again, and this time was very slow in re-starting.

"When you get there, I don't know, Jim. What *are* you going to tell them?"

I wish I could be sure, Mossback.

I know I can make that hot seat hotter by stating no one else knows either, because we've never decided what a prison is for... society's protection, a place to put people like Clarens, where they won't affect the lives of normal folk? A deterrent, a threat, a place to point to as a warning not to break the law? Or, as Thornberry would have it, the first step in returning people to normal lives as functioning members of society again?

Dare I say that the only thing certain about prisons is that so far they haven't worked . . . that stone walls, iron bars, conditioning and drugs that take the reason prisoner, none of these have kept men in . . . that they would always try to escape as long as there was hope, hope of something better on the outside.

As Mosby stepped aside, Bennington considered the reverse of that last thought.

Was there an answer here, to ask his fellow-countrymen to face the immediately, perhaps the forever, impossible, that the only way to keep a man from hoping and trying to get out, was to build a society where they never got in?

Then Bennington remembered Clarens.

No, let's face facts, that till man is superman, there will always be people like Clarens, people who will never be redeemed. People who, no matter how carefully caged or watched, will ever be a potential threat, if only to their keepers. By what weird accident they came to life, well, list that among other facts as yet unknown, and consider only the end result, that there were people whose only pleasure lay in purposeful destruction.

Automatically, such people themselves must be destroyed.

He was only vaguely aware of the flash-bulbs popping as he walked to the chair behind Chief Scott's desk.

That could be an answer, a new addition to the Decalogue, a new Commandment specific to the judge giving sentence to a man like Clarens, an injunction not to jail but to destroy. Simply phrased for the judge, thou shalt not commit!

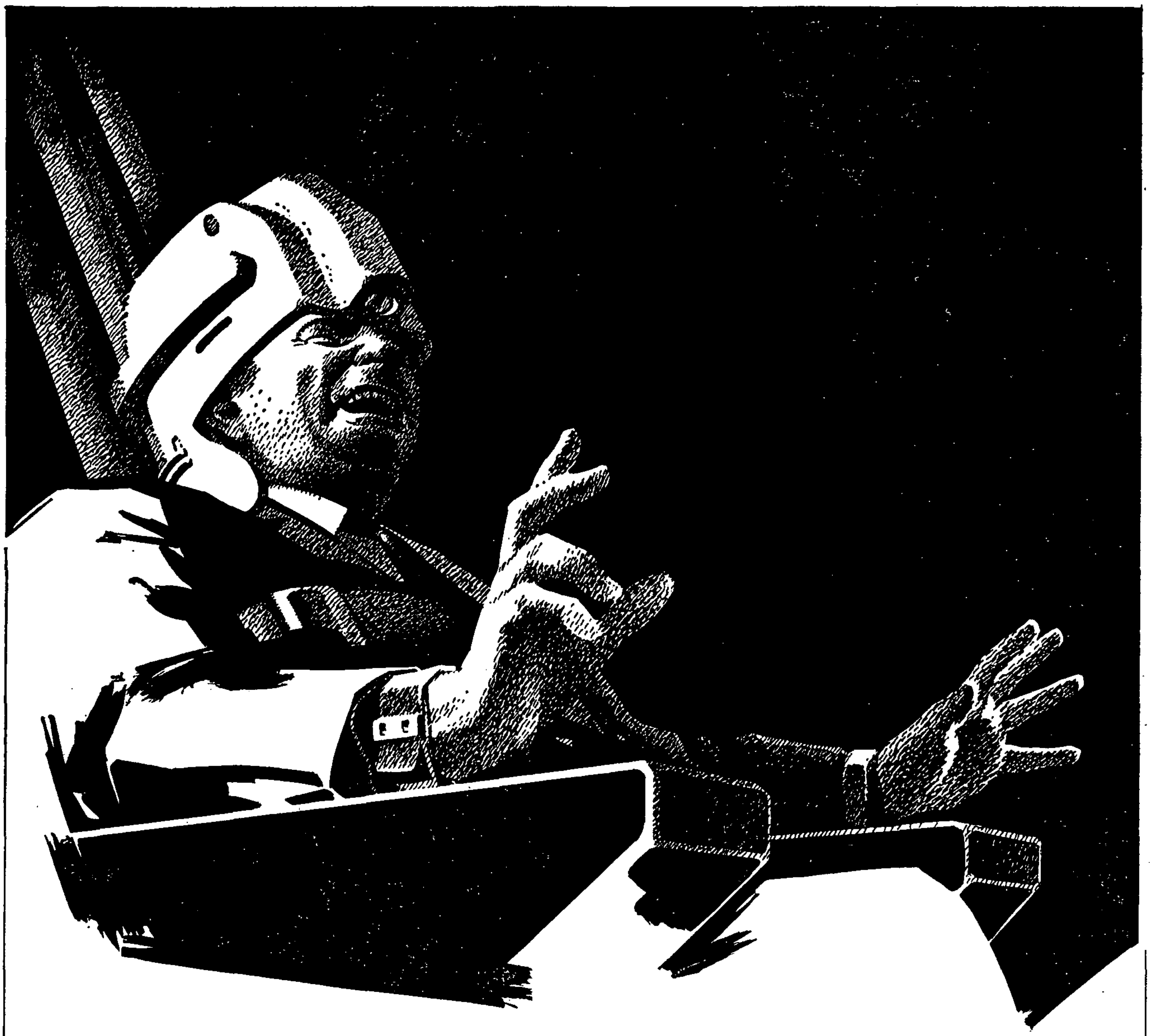
He seated himself and blinked a couple of times, adjusting to the glare.

But, beginning with Thornberry, there would be many people who wouldn't agree, who would never accept such an amendment to the Sacred Ten, people who never seemed to see that phrase in their newspapers every time a child was assaulted, "Police are questioning all known sex offenders."

Bennington looked thoughtfully around at the men ready to question him.

He, too, was ready, ready to tell them . . .

. . . *Some people are a damn sight better off dead.* ■



PLEASANT JOURNEY

It's nice to go on a pleasant journey.
There is, however, a very difficult question concerning
the other half of the ticket . . .

BY RICHARD F. THIEME

Illustrated by George Schelling

"What do you call it?" the buyer asked Jenkins.

"I named it 'Journey Home' but you can think up a better name for it if you want. I'll guarantee that it sells, though. There's nothing like it on any midway."

"I'd like to try it out first, of course," Allenby said. "Star-Time uses only the very best, you know."

"Yes, I know," Jenkins said. He had heard the line before, from almost every carnival buyer to whom he had sold. He did not do much business with the carnivals; there weren't enough to keep him busy with large or worthwhile rides and features. The amusement parks of the big cities were usually the best markets.

Allenby warily eyed the entrance, a room fashioned from a side-show booth. A rough red curtain concealed the inside. Over the doorway, in crude dark blue paint, was lettered, "Journey Home." Behind the doorway was a large barnlike structure, newly painted white, where Jenkins did his planning, his building, and his finishing. When he sold a new ride it was either transported from inside the building through the large, pullaway doors in back or taken apart piece by piece and shipped to the park or carny that bought it.

"Six thousand's a lot of money," the buyer said.

"Just try it," Jenkins told him.

The buyer shrugged. "O.K.," he said. "Let's go in." They walked through the red curtain. Inside the booth-entrance was a soft-cushioned easy-chair, also red, secured firmly in place. It was a piece of salvage from a two-engine commercial airplane. A helmet looking like a Flash Gordon accessory-hair drier combination was set over it. Jenkins flipped a switch and the room became bright with light. "I thought you said this wasn't a thrill ride," Allenby said, looking at the helmetlike structure ominously hanging over the chair.

"It isn't," Jenkins said, smiling. "Sit down." He strapped the buyer into place in the chair.

"Hey, wait a minute," Allenby protested. "Why the straps?"

"Leave everything to me and don't worry," Jenkins said, fitting the headgear into place over the buyer's head. The back of it fitted easily over the entire rear of the skull, down to his neck. The front came just below the eyes. After turning the light off, Jenkins pulled the curtain closed. It was completely black inside.

"Have a nice trip," Jenkins said, pulling a switch on the wall and pushing a button on the back of the chair at the same time.

Currents shifted and repatterned themselves inside the helmet and were fed into Allenby at the base of his skull, at the medulla. The currents of alternating ions mixed with the currents of his varied and random brain waves and the impulses of one became the impulses of the other. Allenby jerked once with the initial shock and was then still, his mind and body fused with the pulsating currents of the chair.

Suddenly, Roger Allenby was almost blinded by bright, naked light. Allenby's first impression was one of disappointment at the failure of the device. Jenkins was reliable, usually, and hadn't come up with a fluke yet.

Allenby got out of the chair and called for Jenkins, holding on to the arm of the chair to keep his bearings. "Hey! Where are you? Jenkins!" He tried to look around him but the bright, intense light revealed nothing. He swore to himself, extending his arms in front of him for something to grasp. As he groped for a solid, the light became more subdued and shifted from white into a light, pleasant blue.

Shapes and forms rearranged themselves in front of him and gradually became distinguishable. He was in a city, or on top of a city. A panoramic view was before him and he saw the creations of human beings, obviously, but a culture far removed from his. A slight path of white began at his feet and expanded as it fell slightly, ramplike, over and into the city. The buildings were whiter than the gate of false dreams that Penelope sung of and the streets and avenues were blue, not gray. The people wore white and milled about in the streets below him. They shouted as one; their voices were not cries but songs and they sang his name.

He started walking on the white strip. It was flexible and supported his weight easily. Then he was running, finding his breath coming in sharp gasps and he was among the crowds. They smiled at him as he passed by and held out their hands to him. Their faces shone with a brilliance of awareness and he knew that they loved him. Troubled, frightened, he kept running, blindly, and, abruptly, there were no people, no buildings.

He was walking now, at the left side of a modern superhighway, against the traffic. Autos sped by him, too quickly for him to determine the year of model. Across the divider the traffic was heavier, autos speeding crazily ahead in the direction he was walking; none stopped. He halted for a moment and looked around him. There was nothing on the sides of the road: no people, no fields, no farms, no cities, no blackness. There was nothing. But far ahead there was green etched around the horizon as the road dipped and the cars sped over it. He walked more quickly, catching his breath, and came closer and closer to the green.

Allenby stopped momentarily and turned around, looking at the highway that was behind him. It was gone. Only bleak, black and gray hills of rock and rubble were there, no cars, no life. He shuddered and continued on toward the end of the highway. The green blended in with the blue of the sky now. Closer he came, until just over the next rise in the road the green was bright. Not knowing or caring why, he was filled with expectation and he ran again and was in the meadow.

All around him were the greens of the grasses and leaves and the yellows and blues of the field flowers. It was warm, a spring day, with none of the discomfort of summer heat. Jubilant, Roger spun around in circles, inhaling the fragrance of the field, listening to the hum of insect life stirring back to awareness after a season of inactivity. Then he was running and tumbling, barefoot, his shirt open, feeling the soft grass give way underfoot and the soil was good and rich beneath him.

He saw a stream ahead, with clear water melodiously flowing by him. He went to it and drank, the cold, good water quenching all his thirst, clearing all the stickiness of his throat and mind. He dashed the water on his face and was happy and felt the coolness of it as the breeze picked up and swept his hair over his forehead. With a shake of his head he tossed it back in place and ran again, feeling the air rush into his lungs with coolness and vibrance unknown since adolescence. No nicotine spasms choked him and the air was refreshing.

Then up the hill he sped, pushing hard, as the marigolds and dandelions parted before him. At the top he stopped and looked and smiled ecstatically as he saw the green rolling land and the stream, curving around from behind the house, his house, the oaks forming a secret lair behind it, and he felt the youth of the world in his lungs and under his feet. He heard the voice calling from that house, his house, calling him to Saturday lunch.

"I'm coming!" he cried happily and was tumbling down the hill, rolling over and over, the hill and ground and sky blending blues and greens and nothing had perspective. The world was spinning and everything was black again. He shook his head to clear the dizziness.

"Well?" Jenkins said. "How was it?"

Allenby looked up at him as Jenkins swung the helmet back and unhooked the seatbelt. He squinted as Jenkins flipped the lightswitch and the brightness hit him.

His surroundings became distinguishable again very slowly and he know he was back in the room. "Where was I?" he asked.

Jenkins shrugged. "I don't know. It was all yours. You went wherever you wanted to go, wherever home is."

Jenkins smiled down at him. "Did you visit more than one place?" he asked. The buyer nodded. "I thought so. It seems that a person tries a few before finally deciding where to go."

The buyer stood up and stretched. "Could I please see the barn?" he asked, meaning the huge workshop where Jenkins did the construction work.

"Sure," Jenkins said and opened the door opposite the red curtain into the workshop. It was empty.

"You mean it was all up here? I didn't move at all?" He tapped his cranium with his index finger.

"That's right," Jenkins said anxiously. "Do you want it or not?"

Allenby stood looking into the empty room. "Yes . . . yes, of course," he said. "How long did the whole thing last?"

"About ten seconds," Jenkins said, looking at his watch. "It seems much longer to the traveler. I'm not sure, but I think the imagined time varies with each person. It's always around ten seconds of actual time, though, so you can make a lot of money on it, even if you only have one machine."

"Money?" Allenby said. "Money, yes, of course." He took a checkbook from his inside pocket and hurriedly wrote a check for six thousand dollars. "When can we have it delivered?" he asked.

"You want it shipped the usual way?"

"No," Allenby said, staring at the red-cushioned chair. "Send it air freight. Then bill us for the expense."

"Whatever you say," Jenkins said, smiling, taking the check. "You'll have it by the first of the week, probably. I'll put a complete parts and assembly manual inside the crate."

"Good, good. But maybe I should test it again, you know. Star-Time can't really afford to make a mistake as expensive as this."

"No," Jenkins said quickly. Then, "I'll guarantee it, of course. If it doesn't work out, I'll give you a full refund. But don't try it again, today. Don't let anyone have it more than once in one day. Stamp them on the hand or something when they take the trip."

"Why?"

Jenkins looked troubled. "I'm not sure, but people might not want to come back. Too many times in a row and they might be able to stay there . . . in their minds of course."

"Of course, of course. Well, it's been a pleasure doing business with you, Mr. Jenkins. I hope to see you again soon." They walked back to Allenby's not-very-late model car and shook hands. Allenby drove away.

On the way back to the hotel, and as he lay for a long time in the bathtub, letting the warmness drift away from the water, the thought ran over and over in his mind. They might be able to stay there, Allenby said to himself. They might be able to stay there. He smiled warmly at a crack in the plaster as he thought of the first of the week and the fragrant meadow. ■

INTERVIEW

The modern TV interview merely has a pre-arranged script and a prompter-box. The future will no doubt see more efficient—more reliable—ways of getting the results wanted . . .

BY FRANK A. JAVOR

ILLUSTRATED BY LEO SUMMERS

Looking at the woman, Lester V. Morrison felt deep inside himself the stirring of sympathy, familiar, rising to the sustained, heady rapport that made him know, with the certainty of long experience, that this was going to be another of his great interviews.

He smiled and loosened the fist he'd made unconsciously to emphasize the word "great" when it passed through his mind.

He felt a light touch on his arm and turning, bowed his head so that his lead technician could slip over it the video-audio headband. Its close-fitting temple pieces curved to touch the bone behind his ears and the twin stereo viewfinder cameras came down over his eyes.

Lester rather liked to make the subdued bowing movement, the symbolic humbling, it pleased him to think, of his six-and-almost-a-half-foot tallness to receive the crownlike headgear of his craft. A crown heavy, not with the scant two ounces of transmitting metal and optical plastic, but heavy with his responsibility to the billions upon billions of viewers who would see what Lester looked upon, would hear what he turned his ear to; the center of their universe for those moments the spot upon which Lester stood, the signal spreading outward from it like the ripple-pattern of a dropped stone.

His technician pressed Lester's arm twice and stepped back. Lester stood erect, his hands and fingers hovering over the twin-arced rows of buttons and rods set in the flat surface of the control-console he wore high on his chest like an ancient breastplate. There was no speaking between Lester and his four-man crew, nor any testing of equipment. Lester wore his responsibility with what he considered a suitable humility, but with a firm confidence. Let lesser men fiddle with their equipment, talk, blur the virgin spontaneity of the look that would flash into the woman's eyes with the first impact of Lester's equipment upon her. His men, like Lester, were the absolute best in their field; razor honed by long close union and good pay until they responded almost symbiotically to Lester and each other.

A clear warning warble from his left earphone, heard only by Lester through the bones of his skull readied him to begin his task. He stood firmly tall, silent, waiting . . .

A musical bleat. The suddenly glowing red face of the timer in the upper corner of his left viewfinder. He was on the air.

The general view first. Eight seconds to set the scene, to let his viewers see for themselves the sordid slum he was standing in. To see the aged, crumbling buildings, some of them as much as twelve and even fourteen years old, engineered to have been torn down and replaced long ago. Long before a tragedy of this kind could strike. To form their own opinion of a council that could allow such a blight to exist on their planet.

Smoothly Lester pivoted his body, one shoulder leading, a counterbalance for the slightly trailing head, editorializing subtly by what he chose to look at, by what he chose to ignore. Flowingly, easily, compensating automatically for even the rise and fall of his own controlled breathing. A beautifully functioning, rock-steady camera vehicle Lester was. It was the least of his interviewing skills.

A closer shot. His thumb brushed a rod on his breastplate. The view in his finders grew larger. Armor-suited men, resting now, but still strapped in the seats of their half-track diggers. Orange-painted against the greening dust and the bright red glow of the police-erected crowd-control barrier force-field like a sheltering dome over them. Through it, visible above and around in all directions, a swirling, shifting mass upon mass of human beings. Some in fliers, others on skimmers. Some strapped in one-man jumpers and even on foot. A boiling, roiling swarm of the morbidly, humanly curious pressing all around, straining toward the little knot of blue-coverall-clad men and their pitifully small, broken burden.

Lester's fingers and palms brushed the rods and buttons of his breastplate-console. Let the rattle and the clank and the sound of the crowd stay as they are. A shade more of the force-field's rasping hum to warm his viewer's nerve endings . . . to ready them . . .

The woman's sobbing. His thumb touched a stud. Let it start to come through now. Softly . . . barely hearable . . . subtly swelling.

The little knot of blue-coverall-clad men. A medium shot, then rapidly to a close-up of their burden, the dangling limbs half-hidden by their bodies and the merciful sagging of the blue green plasti-sheet. A tight shot, but passing . . . the merest flicker. Nothing staring, nothing lingering, nothing in bad taste.

In Lester's right ear was the sound of his own voice, recorded on his way to the scene and before he came upon it so that he would not need to break his silence until his selected moment. His voice giving the boy's age, his group-affiliations, the routine details of his death. All quietly, all monotonously even, the greater to contrast with what was the meat of Lester's program.

Nineteen seconds. The sobbing louder now and growing. The mother, kneeling, body sagged, hands clenched, dark head bowed.

Lester put a hand on her shoulder, letting it show in his finders, knowing that each of his viewers could see it as his own, extended, sympathetic, understanding . . .

The woman did not respond to his touch. Unobtrusively Lester increased the pressure of his thumb, gouging. She stirred under his hand, shrinking, her head lifting.

Lester's hand darted back to his console.

Her eyes. Dark, dulled, beseeching. *Fine.*

And now Lester spoke. He spoke with practiced hesitance, the gentle respecter, for his viewer, of her desire and right to her privacy at a time like this.

"How do you feel to have lost your only child?" His hands hovering, the woman looking at him . . . *now.*

Her eyes widened, flickeringly. Sorrow surging and pain, deep and of the soul, opened to the finder. Raw, fresh.

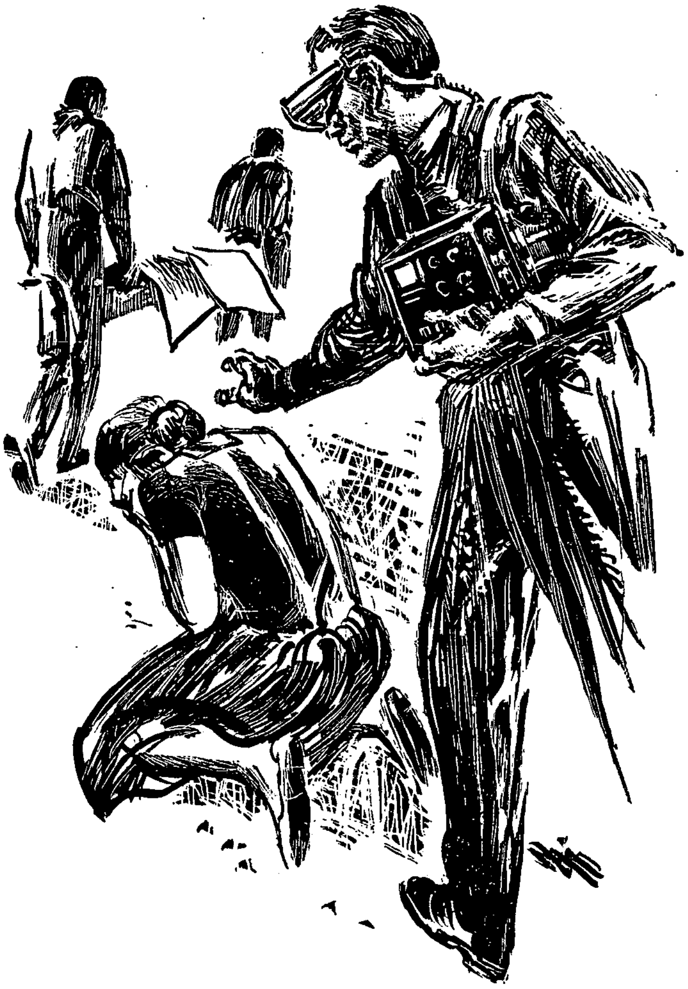
Great. I'm right never to test, never to speak until this moment.

"Please try to control yourself. I'm your friend, we're all your friends. Tell us." And he repeated his question.

Her head bent sharply back, the eyes half closing now, her mouth open, the lips trembling, the intensity of her emotion visibly choking the sound in her throat, making of her attempt to speak a silent mouthing.

Easy . . . easy does it.

Her hands came up. Fists, pressing against each other



and under her chin. "My baby, my baby," and her voice was a moan.

Lester needed only the one hand, his left. The other he stretched toward the woman, touching her hair, his fingertips only, gently, benevolently, seeing it in his finder, looking deep into her upturned face.

In the corner of Lester's finder the sweep-second hand began to wipe the red glow from the timer's face. When it came around to the twelve, except for the sponsor break and his verbal sign-off, he would be off the air.

Sobs began to rock the kneeling woman. Ligthly at first, a mere staccato catching of the breath, but growing. Growing in a crescendo of violence that, peaking, made of her body a heaving, thrashing, straining animal thing.

Great racking, convulsive sounds rasped from her throat. A thread-thin trickle of blood started from one corner of her tortured mouth.

Enough.

Her head dropped, her whole body now bowed and shaking.

Lester watched his hand go out to her, stop in midair. He did not try to hide its trembling. His fingers closed, his hand came back, not having touched her. Leaving her, huddled, tremulous, to herself and her great sorrow.

Slow fade and . . . go to black.

Ninety seconds. Exactly and on the dot and another of his human-interest segments for the intergalactic network was over; another moment in the life story of a little person had been made immortal.

Lester eased his headgear off, handed it to the waiting technician, stood rubbing the spots where the temple pieces had pressed. The woman had stopped trembling now and was looking dazed, uncomprehending. *They always do, the subjects.*

Swiftly, but not too roughly, Lester raised up her limp left arm, undid the cuff and stripped off the tiny receptor taped to the wrist. Another he took from her ankle and two more from the back of her skull, from under the concealing black hair. He could have left to one of of his technicians this stripping off of the tiny receptors, that, obedient to the commands of his console, sent their impulses impinging upon the nerve-streams of his subjects. But Lester felt that doing it himself, this body contact with his subjects, was just one more tiny factor that helped keep fresh his unmistakable feeling of rapport.

His lead technician touched his shoulder from behind, indicating they were about ready for his verbal signature and the one part of his program Lester found distasteful. A compliance with a regulation he felt was onerous and a little demeaning. Some day those who made these artistically pointless rulings would recognize the validity of his technique and perhaps eliminate this abhorrent note. Until then . . .

Lester leaned forward and spoke into the button mike his technician was holding out to him.

And at the end, ". . . The emotional response of the subject was technically augmented." ■

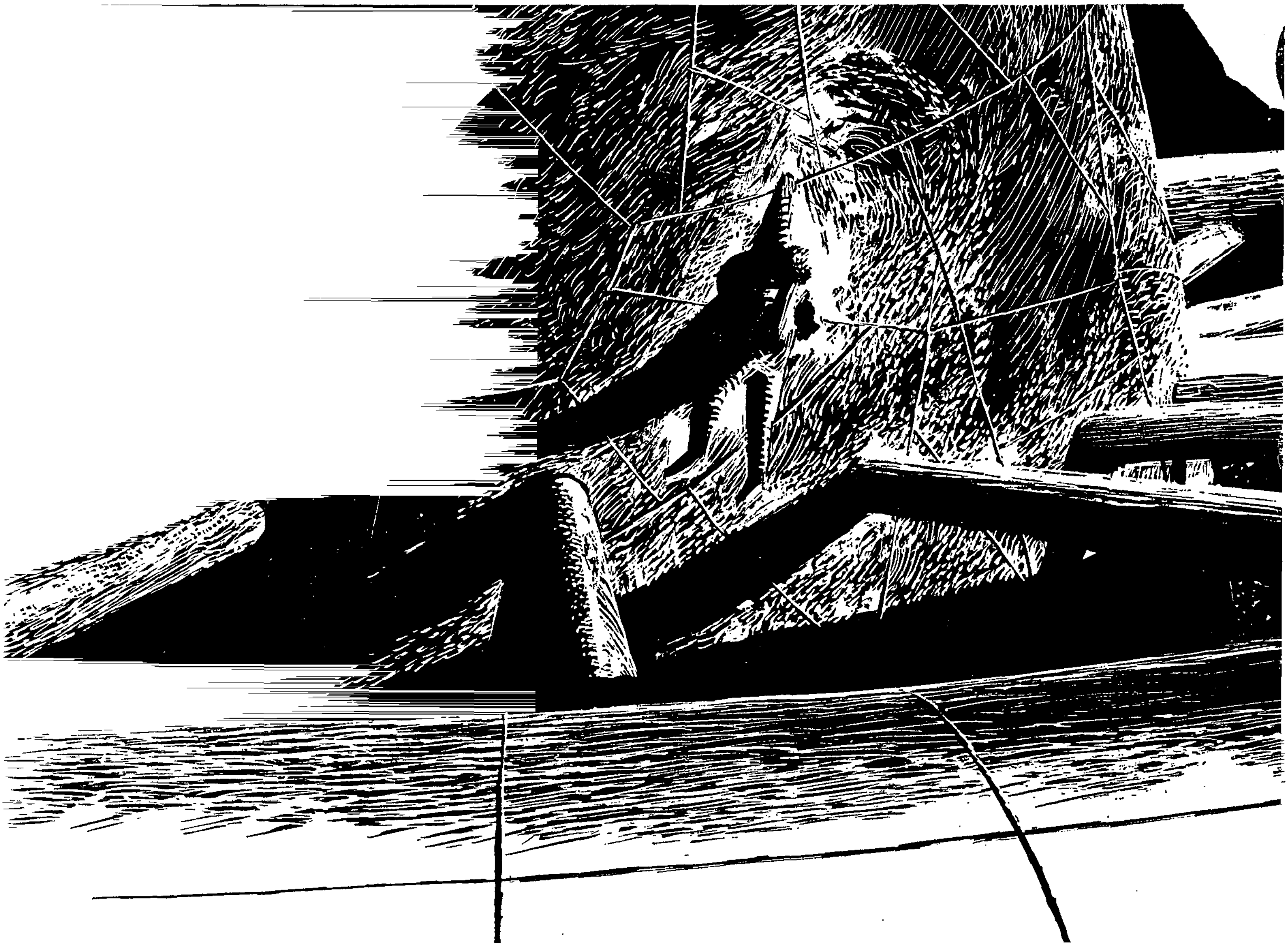
IN TIMES TO COME

Like any other Department of Prophecy, our prophet sometimes slips out of synch—goes into a wrong phase relationship—anyhow, gets wrong answers. "Thin Edge," by Johnathan Blake Mackenzie, was supposed to be in this issue; somehow, when this lead-tin-bismuth alloy jigsaw puzzle called ANALOG was made up, it proved so inelastic that not even a thin edge could be slipped in.

If the Prophecy Department isn't out of phase again . . . it'll be here next month. It's an interesting little yarn about the consequences inherent in having a razor-edged blade . . . without the blade. Like the practical jokes you can—ha ha!—play with it . . .

However, the feature in the next issue and in the next two, also, will be "Dune World"; Frank Herbert's new novel. Herbert evidently goes to extremes; his last novel, you will remember, was "Under Pressure" (which appeared in book form as "Dragon in the Sea" and contained, in fact, the first published description of the use of "plastic balloons" for transporting great quantities of liquids by sea; an item which has since been patented and used.) In that one the characters were under pressure of war—and deep seas.

In "Dune World" the pressure of war and conflict is there—but the pressure of the environment is not deep water. It is the almost total absence of water on a world with one invaluable and unmatchable product—and one immense super-dehydrated desert. Where wealth isn't measured in gold or gems, but millilitres. And the people are few but very, very hardy . . . THE EDITOR



WHERE I WASN'T GOING

Second of Two Parts The trouble with a One World Government —no matter how it comes about—is that it is almost sure to try to tell everybody how to think and feel about everything And who can escape, when all the world is under their control . . .

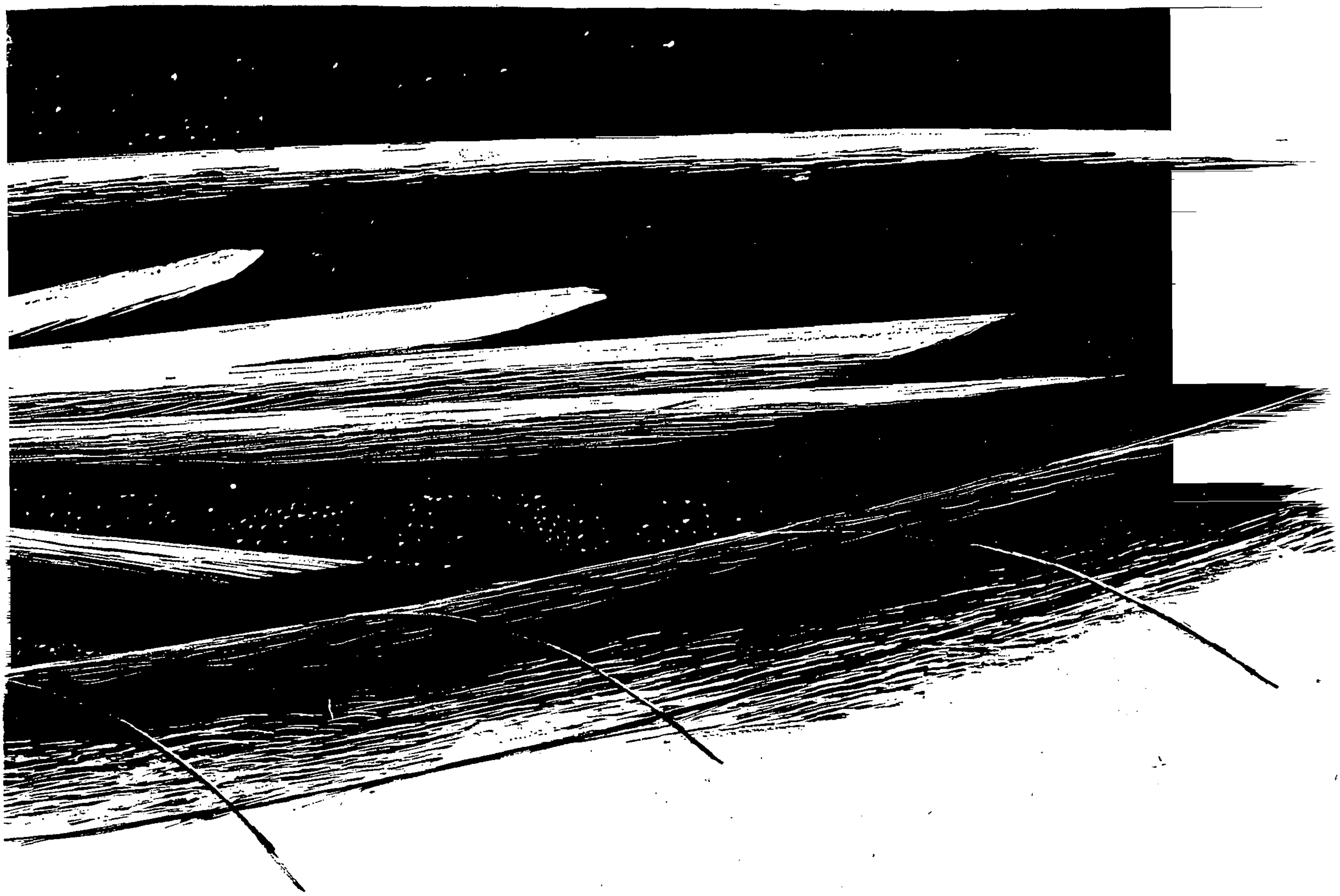
WALT and LEIGH RICHMOND

Illustrated by John Schoenherr

Synopsis

Space Lab One has just been completed and put into spin by the pick of the crews of scientists and engineers who will man her for her first three months of operation, before being rotated back to Earth. The lethal effects of radiation in space have been nearly obviated by the twenty rivers of water that encircle the rim of the Space Lab and provide six feet of shielding, but the ruling is still fifteen months recovery time from space radiation for every three months aboard. The rivers of the lab's rim shield her personnel, provide her spinning power, and are the source of much of her ecology.

Project Hot Rod, an experimental laser project, is anchored to a Bourdon tube five miles from the lab, a huge ballon eight thousand feet through, facing the sun and gold-plated inside one half her surface to make that half a mirror, its focal plane on the three thousand-feet length of laser rods that form a barrel down her center, concentrating three hundred seventy-five megawatts of power from the sun into a beam which is mirror-focused for delivery to Earth. She is ready to be turned on for her first



test, when a solar flare erupts sending a storm of protons towards the space lab.

When the flare erupts, the personnel of the space lab have eight minutes in which to withdraw from the now inadequate shielding of the rim, into the central hub, where the waters, also drawn from the rim, will form a twenty-four-foot shielding for the duration of the proton storm. The evacuation is made in time. Hot Rod is turned over to Earth control on its tight communications beam, while its personnel of scientists and Security officers seek the shelter of the lab-hub.

Meantime, unknown to those aboard, the Security forces of the United Nations have secretly planned a take-over of Earth which hinges on Hot Rod, the laser project that can be either the greatest source of industrial power man has ever known, or the most powerful weapon ever devised. The organizational plan is to create an "incident" when Hot Rod has proved her efficiency and take over Earth using Hot Rod as both an excuse and a weapon. Major Steve Elbertson, chief Security officer aboard, is secretly General Elbertson, Security's "Commander of all Space Forces." He receives a serious dose of radiation during the flare evacuation and is under sedation when.

Dr. Y. Chi Tung (Ishie), physicist, has been experimenting with the realignment of protons in plastic. He secretes his device in the flare-protected hub with the co-operation of Mike Blackhawk, chief engineer. Mike experiments with the device, introducing several variations, and accidentally achieves a hook into the forces of inertia, which gives the plastic in the device a six hundred forty pound thrust. Mike does not realize this has happened

Space Lab One, and the attendant satellites anchored to it—Hot Rod, the "dump," and a nuclear power pile anchored ten miles off, represent a combined seventy-eight million pounds of mass, but are in orbit in space The six hundred forty pounds of thrust is aligned with the north-south axis of the lab, and accentuates the orbit at right angles. The thrust is compounded, of course, per second per second, and the mosquito push moves the lab —in microcentimeters at first, but each microcentimeter is compounded per second per second. By the time that the fifteen meter slack in the cable on which Hot Rod swings *free of its anchor tube is tautened—with the pull near Hot Rod's center of gravity at the base of her laser barrel —the thrust would have represented two point eight million ergs of energy, if it had been applied direct. But it is transmitted through the short end of a long lever. The motion at the beam director mirror, a full diameter out from the eight thousand foot diameter balloon that is Hot Rod, is multiplied nearly sixteen thousand times. Hot Rod rolls on its center of gravity, and its beam-director mirror swings in a huge arc. Sixteen thousand centimeters per centimeter of original motion. Eight hundred and seventy-three meters in the first second, before the tracking servos take over and begin to fight back.*

The communications beam to Thule Base is broken, and the fail-safe fails to fail safe. Hot Rod turns on and three hundred seventy-five million watts of energy lash out towards Greenland, dancing over it in a decreasing Lissajous pattern—wiping out Thule Base before the servos finally take over and the giant laser settles itself to the task that has been read into its automatics as its pilot project—burning a hole through the Greenland ice cap at a spot eighty miles north of the now nonexistent control base.

Alerted finally that something is wrong, the personnel aboard the space lab get Hot Rod turned off; but the storm of protons rages outside and it would be fatal to send anyone out on an exploratory venture to see what happened. They finally deduce that a meteor has been the saboteur, since not even its inventors know of the space drive aboard.

With Hot Rod safely secured, and power off, repair can wait until the lethal storm is over. The lab settles down, while unknown to any of them the drive, nicknamed the Confusor, churkles to itself as second after second is squared and the velocity of a snail builds ever upward.

When Mike Blackhawk wakes, six hours later, he consults the big computer, known as the Sacred Cow, finally discovers that the Confusor is a space drive, that the satellite is under thrust, and that he and Ishie are responsible for having wiped out Thule Base. He alone aboard knows these facts. He goes to summon Ishie.

Part 2

Mike Blackhawk located Dr. Y. Chi Tung's hammock, and nudged the scientist unceremoniously. The small physicist awoke and attempted to sit up in one gesture; bumped his head on the hammock above, and laid back down just as suddenly.

"Come on down to engineering will you Ishie?" The request was spoken softly.

"Hokey, dokey," said Ishie and crawled out of the narrow aperture with the agility of a monkey.

Gesturing to the other to follow him, Mike led the way to the galley first, where the two picked up the readied breakfast and took them to Mike's quarters.

The "cups" of coffee were squeeze bottles; the trays were soft plastic packages, similar to the boil-in-the-bag containers of frozen food that had been common on Earth for some time.

Mike hesitated at the entrance to his engineering quarters, considering whether to shut the bulkhead, but discarded the idea as being more of an attention-getter than a seal for secrecy. He gestured Ishie to the bunk, and parked himself at his console.

"We're in trouble," he said. "You and I together are responsible for the first space attack on Earth."

He stopped and waited, owl-eyed, but the small physicist simply tackled his breakfast with no further comment than a raised eyebrow.

"We," said Mike solemnly, "wiped out Thule Base last night."

"As Confusion would say, there's no Thule like a dead Thule. What are you getting at Mike? You sound serious."

"You mean you slept through . . . you didn't know we . . . you didn't hear the . . . yes, I guess you slept! Well . . ."

Rapidly Mike sketched the events of the past nine hours, bringing his story completely up to date, including the information he'd gleaned from the Cow, but making no reference to his access to the computer's knowledge. Instead, he attributed the conclusions to himself.

The physicist sat so still when he had finished that Mike became seriously concerned. "Thule . . ." he began, but Ishie started to speak.

"Mike, it did? It couldn't . . . but . . . of course, it must have . . . the fields . . . six hundred forty pounds of thrust! Only six hundred forty, yet . . . yes, it could, if the thrust were exactly aligned . . . thrust . . . Mike, thrust! *Mike, thrust!* Real thrust! Mike do you know what this means?" His eyes were alight. His voice was reverent. He sprang from the bunk and knelt before the rack that held the churkling Confusor.

"My pretty," he said. "My delicate pretty. What you have done! Mike, we've got a space drive!"

"Ishie. Don't you realize? We wiped out Thule!"

"Thule, schmule—Mike, we've got a space drive!"

Mike grinned to himself. He needn't have worried. Not about Ishie, anyhow.

But now Ishie was gesturing him over.

"Mike," he said, "you must show me in detail. In exact detail. What did you do? What was your procedure?"

Mike came over and casually reached towards the churkling device, saying "Why, I—" but Ishie reacted with catlike swiftness, blocking the man before he could even touch the rack.

"No, don't touch it! Just *tell* me what you did!"

Carefully now, Mike began outlining in detail his inspection of the device and each step he had taken as he added to its complexities.

When he had finished, the two sat back on their heels thinking. Finally, Mike spoke.

"Ishie, will you please tell me just how does this thing . . . this Confusor . . . *get* that thrust? Just exactly what is involved here?"

Ishie took his time answering, and when he did his words came slowly "Ah, yes. Confusor it is. I was attempting to confound Heisenberg's statement; but instead I think between us we have confused the issue.

"Heisenberg said that there was no certainty in our measurement of the exact orbit of an electron. That the instrument used to measure the position of the electron must inevitably move the electron; and the greater the attempt at precise measurements, the greater the error produced by the measurements.

"It was my hope," he went on, "to provide greater accuracy of measurement, by use of statistics over the vast number of electrons in orbit around the hydrogen atoms within the test mass. But this, apparently, will not be.

"Now to see what it is we have done.

"First, let us make a re-expression of the laws of math-physics. You understand that I am feeling my way here, for what we have done and what I thought I was doing are quite different, and I am looking with hindsight now at math-physics from the point of reality of this thrust.

"As I understand it, there's a mutual exclusiveness of particles, generally expressed by the statement that two particles may not occupy the same space at the same time.

"But as I would put it, this means each particle owns its own place. Now, inertia says that each particle not only owns its own place, but owns its own temporal memory of where it's going to be unless something interferes with it.

"Now let me not confuse you with semantics. When I say 'memory' and 'knowing' I am not implying a sentient condition. I am speaking of the type of memory and knowing that is a strain in the structure of the proton or atom. This is . . . well, anyhow, not sentient. You will have to translate for yourself.

"So to continue, inertia, the way I would put it, says that each particle not only owns its own place, but owns its own temporal memory of where it is going unless it is interfered with.

"In other words, the particle arriving here, now, got here by remembering in this other sense that it was going from there to there to there with some inherent sort of memory. This memory can't be classified as being in relation to anything but the particle itself. No matter how you move the things around it, as long as the things around it don't exert an influence on the particle, the particle's memory of where it's been and where it's going form a continuous straight line through space and must, therefore, have spatial co-ordinates against which to form a 'memory' pattern of former and future action.

"Now as I understand gravity, it's simply the statement that all the particles in space are covetous, in this same non-sentient sense, of the position in space of all their neighboring particles. In other words, it's a contravention or the attempted contravention of the statement that two particles may not be in the same place at the same time. It seems that all particles have an urge to try to be in each other's space. And this desire is modified by the distance that separates them.

"This adds up to three rules:

"1. No two particles may occupy the same space at the same time.

"2. Even though they can't, they try.

"3. They all know where they're going, and where they've been without relation to anything but the spatial co-ordinates around them.

"That third statement seems to me to knock something of a hole in Einstein's relativity theory. Unless you wish to grant all these particles some method of determining their relationship to particles that are not near them.

"Communication between particles by any means is apparently limited by the speed of light, which is a relationship between space and time, but apparently, from what we know of inertia, if the universe contained only a single particle, and that particle was in motion, it would continue to move regardless of the fact that its motion could not be checked upon in relation to other particles.

"This indicates to me that the particle has an existence in space because it is created out of space, and that space must, therefore, have some very real properties of its own regardless of what is or is not in it. The very fact that there is a limiting speed to light and particle motion introduces the concept that space has physical properties.

"In order to have an electromagnetic wave, one must have a medium in which an electric field or a magnetic field may exist. In order to have matter, which I believe to be a form of electromagnetic field in stasis, one must have special properties which make the existence of matter possible. In order to have inertia, one must also have spatial properties which make the existence of inertia possible.

"People are fond of pointing out that there's nothing to get hold of in free space in order to climb the ladder of gravity, or in order to move between the planets, and that the only possiblility of motion of a vehicle in space is to throw something away, or, in other words, lose mass in order to gain speed by reaction. Which is simply a statement that as far as we can tell a force can only be exerted relative to two points—or between two points or masses.

"But this does not account for the continuance of motion once started.

"Inertia says a body will move once started, but it doesn't say why or how. How does that particle once started gain the knowledge to continue without some direct control over its spatial framework? That it will continue, we know. That in the presence of a gravitic field or a magnetic field or other attractive force at right angles to its motion, we can create an acceleration which will maintain it in an exactly circular path called an orbit. But how does it remember, as soon as that field ceases to exist, where it was going before it was last influenced? That it will continue in a straight line indefinitely, without such an influence, we know. That it can be influenced over a distance by various field effects, we also know. But what is the mechanism of influence whereby it influences itself to continue in a straight line? And what handle did we get hold of to convert that influence of self to our own advantage in moving this ship?"

Mike stared at Ishie with vast respect.

"I thought you physics boys did it all with math," he said softly, "and here you've outlined the facts of space that an Indian can feel in his bones—and you've done it in good, solid English that makes some sense.

"In other words," Mike was almost talking to himself as he tried to reword Ishie's theorizing into his own type of thinking, "the particle in motion creates a strain in the fabric—the field—of space; and that fabric must attempt to relieve itself of the strain. A particle in motion makes it possible for the fabric of space to smooth itself out behind the particle; and the fabric attempts to smooth itself on through the area occupied by the particle while it is moving, and so the fabric of space smoothing itself is a constant thrust behind the particle's motion, continuing that motion and making the particle scat to where he wasn't going.

"When that same particle is stopped," Mike was visualizing the process to himself, "the force of the attempt to smooth itself out by the fabric of space exists equally around the particle on all sides; so that the particle will be held stopped by the attempt of the fabric to smooth itself until set into motion again by a force greater than that of inertia—for inertia, then, is the attempt of the fabric of space to smooth itself.

"Quite possibly," Mike was speaking very slowly now as he mocked up and watched the forces of this inertia, "matter itself is created out of the fabric of space, and in its creation, in the stasis condition that keeps it existing as a particle rather than dissolving back into the original fabric, it creates the strain in the fabric—in space—that will then seek to smooth itself so long as the particle shall exist.

"Thus this, then is inertia—the attempt of the fabric of space to smooth itself; to get rid of the strain of the particle that has been created from itself."

Ishie shook his head. "Not quite," he said, "but you're getting close."

Mike shook himself like a dog coming out of water.

"Oh, well," he said. "Anyway, we've got a space drive —flea-sized. Now the question before the board becomes, just what are we going to do with it? Turn it over to the captain?"

"Confusion say," said Ishie, "he who has very little is often most generous. But he who has huge fortune is very cautious about dispersing it. Let's first be sure what we've got," he grinned slyly at Mike, "before we become overgenerous with information."

Mike heaved a huge sign of relief. He had been afraid he would have to argue Ishie into this point of view.

"Speaking of math, Mike, you're no slouch at it yourself, if you figured out all those orbit co-ordinates in your head, and arrived at an exact figure on the amount of thrust. It would be very nice for our future investigations if we had some method of putting the Cow to work on this." The little physicist sat back, grinned knowingly, and continued: "Where's your secret panel, Mike? We've got to keep this information from going to anybody else."

"Oh, I already—" Mike stopped. "I mean," he floundered, "uh . . . how did you know?" A foolish grin spread over his face. "It's right behind you," he said. "And I've got it by voice," he said. "Just push the switch in the corner and talk to it."

Ishie turned, glanced at the panel, and went over to the switch, pushing it. "I wondered how you were concealing the teletype," he said. "You mean you really talk to it?"

The Sacred Cow's voice came back. "Reference not understoo-od. Ple-ease explai-ain."

"Oy!" said Ishie. "It even sounds like a cow!"

"Ye-es, si-ir," said the Cow. "A cow is an he-erbivorous ma-ammal, usua-ally do-omesticated, and fou-ound in moost of the cou-ountries of Ea-arth. Wha-at specific da-ata did you-u wi-ish? The mi-ilk su-upply—"

"Hold it," Mike said, forestalling a long dissertation on the dairy industry.

Catching on quickly to the literal-mindedness of the placid computer, Ishie fired a direct question.

"What is our current position in relation to the equatorial orbit that we should be following?" he asked.

There was a sput from the speaker, very much as though someone had been caught off guard and almost said something, and then the placid reply came back, "That information is top secret. Please identify yourself as Mike and I will answer you."

Ishie groaned, depressed the cutoff switch and turned to Mike.

"You fixed it," he said. "If a simple question like that gets an answer like that, how long do you think it will take the captain to find out something's wrong with the Cow?"

Mike lunged for the switch, but Ishie held him back.

"Hold it, Boy. You've made enough electronic mistakes for one day. This takes some thinking over."

"We better think fast," said Mike. "The captain'll ask that question any second now, or a question like it."

"All right," said Ishie. "First we've got to withdraw your original order—and you'd better not trust your own memory as to what it was. You ask the Cow to tell you what order you gave her making certain information top secret. Then when she tells you exactly what you said, you tell her to cancel *that* order."

Mike did as he was told.

"Why," said Ishie, "did you give such an order in the first place? Never mind answering that question," he added, "but it's lucky she hasn't been refusing to give people the time of day, and referring them to you. As a matter of fact"—glancing up at the clock on the wall—"it looks like she has. That clock hasn't moved since I got here."

Even as he spoke, the clock whirred, jumped forty-five minutes, and settled down to its steady, second-by-second spin.

"Ishie," said Mike, "we figured out a space drive, and that was great. But if we can figure out how to communicate an idea to a computer, we're *real* geniuses."

Ishie turned on the vocoder. "Please supply us," he told the Cow, "with a complete recording of your latest conversation with Mike."

And as the computer started back over the dialogue that has just occurred between herself and Mike, Ishie interrupted. "Not that," he said, "I mean the last previous conversation."

Then he sat back as the Cow unreeled a fifteen minute monologue which repeated both sides of the conversation including the order to make everything top secret.

Having listened through this, Ishie said: "At the point where Mike asks you about acceleration, you will now erase the rest of the conversation and substitute this comment from yourself: 'The lab is being accelerated by an external magneto-ionic effect.' This will be your only explanation of acceleration applied to the ship. Now please repeat your conversation with Mike."

Then he sat back to listen through the recording again.

This time when it came to the part about acceleration, without hesitation, the Cow referred blithely to the external magneto-ionic effect that was causing acceleration.

Then Ishie asked the computer: "How could this effect be canceled?" and listened to a long syllogistic outline which, if condensed to a single, understandable sentence meant simply "by reversing the field in respect to the lab with a magnet on board the lab."

Ishie heaved a great sigh of relief, and said, "Now, Mike, we can go to work. For of course," he added, "we must have authority to install our magnetic coils, and what better authority is there than the Cow?

"Confusion say it is better to have the voice of authority speak with your words than to be the voice of authority.

"Now," he said, "let us see what we have really got here."

As they worked, time progressed. The empty racks around the Confusor slowly filled with more test instruments both borrowed and devised; and the formerly unoccupied corner of the section of panels took on more and more the look of a complete installation, in the center of which the Confusor still churkled quietly, pitting its strength against the mighty monster to which it was so firmly tied.

Two hours were spent in testing circuits, each one exhaustively. Then Ishie turned to Mike.

"We need still yet another test that we have not provided. A strain gauge to find out how much thrust a mosquito puts out. There's one in the physics lab. I'll run get it."

"You will *not,*" said Mike. "Genius you may be, but proton-proof you're not. We can rig that right here."

Walking over to the spare parts locker, Mike brought back a complete readout display panel, a spare from one of the Cow's bridge consoles; and quickly connected it in to the data link on which the vocoder operated. Then, carefully instructing the computer as to the required display, he settled back.

"That'll do it," he said. "The Cow can tell us all we need to know right on that panel—about acceleration, lack of it, or change of it that we may cause by changing the parameters of our experiment. Those racks were checked out to stand up under eighty gees," he added. "Typical overspecification. They never said what would happen to the personnel under those conditions."

Ishie turned the Confusor off and then back on, and watched the display gauge rise to the six hundred forty mark, and then show the fraction above it .12128. Then carefully, ever so infinitesimally, he adjusted a knob on the device. The readout sank back towards zero, coming to rest reading 441.3971.

"We'll have to put a vernier control on this phase circuit," Ishie said to himself. "It jumped thirty per cent, and I scarcely breathed on it."

After a few more checks on the operation of the phase control, he turned to the power control for the magnetic field. Carefully, Ishie lowered the field strength, eye on the readout panel. As the field strength lowered, the reading increased.

The indication was that by lowering the field strength only ten per cent, he had increased the thrust to sixteen hundred pounds—which, he felt, was close to the tolerance of the machine structure.

Carefully he increased the field strength again. Faithfully the reading followed it down the scale.

Then he had another thought. Running the field strength down and the pressure up, and again arriving at sixteen hundred pounds, he turned off the Confusor, waited a few moments, and turned it back on.

The reading remained zero.

Apparently, then a decrease in field strength would cause an increase in thrust; but the original field strength was necessary in order to initiate the thrust field.

Carefully he nudged the field strength back up, and suddenly there were seven hundred ten pounds indicated thrust.

Thrust could apparently be initiated by a field strength a few per cent lower, but not much lower, than the original operating point.

Captain Naylor Andersen arrived on the bridge with an accusing air, but feeling refreshed. He had slept longer than he intended—and though he had asked Bessie to call him when she came back on duty two hours earlier, he had not been called.

"You needed the sleep, captain," she told him unrepentant. "I checked with the Cow. The flare's predicted to continue for another eight hours. We're simply in standby."

However, various observatories on Earth had not been asleep. Within fifteen minutes of the time he reached the bridge, a message from U.N. Headquarters chattered in over the teletype.

"Tracking stations report your orbital discontinuity too great to have been achieved by jet action of nitrogen escaping from Hot Rod. Hot Rod pressures insufficient to achieve your present apparent acceleration. Please explain discrepancy between these reports and your own summation of ten hours previous. Suggest close and continual observation of Project Hot Rod. Suspect, repeat strongly suspect, possibility of sabotage. End message."

Nails Andersen stared at the sheet that the com officer had placed in his hands. Then he pressed the intercom to the morgue.

"Dr. Kimball. Please report to the bridge. Dr. P.E.R. Kimball. Please report to the bridge immediately."

Then he turned to Bessie. "Ask the Cow for an orbit computation from the time of the . . . er . . . meteor last night."

Under Bessie's practiced, computer-minded fingers, the answer wanted came quickly—a displayed string of figures, each to three decimal places, accompanied by a second display on the captain's console showing the old equatorial orbit across a grid projection of the Earth's surface to a point of departure over the mid-Atlantic where it began curving ever farther north, up across the tip of South America, very slightly off course.

The captain glanced at the display of Hot Rod and its taut cable, and realized with a sickening sense of unreality that no jet action on Hot Rod could have caused it to lead the station in this northerly direction; and that instead it was placidly trailing behind. It was now farther south of the Space Lab than its original position; but their orbit had been displaced to the north.

Perk appeared beside the console, but the captain ignored the astronomer for a moment longer, while he leaned back thinking.

What could be the answer? A leak in the Space Lab itself? That would give acceleration; minor, not to have triggered an alarm—it should have triggered an alarm—but acceleration. Sufficient for the off-orbit shown? He did a brief calculation in his head. It wouldn't take much. Very little, for the time that had passed—Very well, then. He put down a leak in his mind as a possibility. Now, water or air? It could be either, if his reasoning this far were correct. He looked up.

"Have the Cow display barometric readings for each section of the rim and for each compartment in the central hub," he said briefly to Bessie; and to the astronomer, "Dr. Kimball, take that side seat at the computer console and check our progress on this orbital deviation," and he gestured at the display on his screen.

Perk moved to the post with only a nod.

The barometric displays held constant, with only fractional deviations that might have been imposed by the spin of the big wheel, or error in the instruments themselves. Balanced against temperature readings, they worked out to possible fractions of gain or loss so small as to be insignificant, indicating only the inaccuracies of measurement that inevitably occur in comparing the readings of a number of instruments.

The captain had hardly digested the readings displayed by the computer when Perk looked up with a puzzled frown.

"The computer records a continuous acceleration over the past eleven hours and forty-three minutes," he said, "and attributes it," he looked even more puzzled, "to a magneto-ionic effect?" There was a definite question in his voice.

"It's only about six hundred forty pounds," he added. "It must be an external effect caused by the flare."

"Please investigate the effect as thoroughly as possible," the captain told Perk, then dictated a message to the com officer.

" 'To U.N. Headquarters, Earth, from Captain Naylor Andersen, commanding Space Lab One. Original assumption that disaster was attributable to meteoric impact on Project Hot Rod appears mistaken. Investigation indicates we are under acceleration from an external magneto-ionic effect which is exerting about—' " he called to Perk, "Did you say six hundred forty pounds?"

The astronomer nodded, and the captain continued, " 'Which is exerting about six hundred forty pound pressure against this satellite. We are now working out corrective measures and will inform you immediately they are prepared. If your observatories can give us any advice, please message at once. End.'"

Then the captain depressed his intercom switch to the morgue. "Dr. Chi. Please report to the bridge. Repeat. Dr. Chi Tung. Please report to the bridge at once."

His own intercom hummed, and a voice came on. "Dr. Chi Tung is not in the morgue. He left with Mr. Blackhawk some time ago."

The captain frowned, but pushed the engineering room intercom. "Is Dr. Chi with you, Mr. Blackhawk?" he asked, and when Mike's voice answered, "Yes, sir," he said, "Will you both report to the bridge at once, please?"

When the two arrived, only a little tardily, on the bridge, the captain addressed Ishie.

"You heard of the disaster last night?" The physicist nodded. "We assumed then," the captain told him, "that a meteor had caused the disturbance. That it had gone through the balloon making a hole through which the balloon's nitrogen was escaping, making a jet action and accelerating the ship.

"It seems, however, that we are under acceleration, and that the acceleration is too great to be caused by such jet action, since Hot Rod does not have sufficient pressure.

"The computer reports that the acceleration is derived from an external magneto-ionic effect. Would such an effect be a result of a flare?" he asked.

"I believe it could, captain. I should have to do a bit of math, but . . ."

"We will assume, then, that the computer is correct," the captain told him. "Could such an effect have a sufficiently great effect on this ship to give it as much as six hundred forty pounds of thrust?"

"Again, I should have to check the math, captain, but I would assume so."

"Mr. Blackhawk," the captain turned to his engineer, "could such a thrust throw Hot Rod off her communications beam and cause last night's disaster?"

"I guess I'd have to check by math, too, captain . . ." Mike appeared to debate the question. "It would be a very small acceleration at first, of course," he said, "from six hundred forty pounds of thrust. But Hot Rod's cable is slack, and the velocity needn't be great to give it quite a jolt when the slack was taken up. Yes, I feel sure *that* could happen, captain."

The captain relaxed a little, and a half-smile played near the corner of his mouth as he said to Mike, "I believe,

then, we may have found the *real* saboteur, Mr. Blackhawk." Then to Ishie. "Doctor, I believe that your field is the one in which the most experience lies towards finding a means for counteracting the effect that is now influencing our orbit. I am putting you in charge of the problem. The pull, according to the computer, is as I said, six hundred and forty pounds. Do you think you can work out a method for counteraction?"

"I think . . . possibly, yes, captain. Let me say, probably yes."

"Then please do so, and report the method to me. I will then submit it to the other scientists aboard that may have some selective knowledge in the field, and to Earth. You may, of course, call on any of the personnel of the ship for assistance, and possibly Mr. Blackhawk may be of assistance to you. He is familiar with the equipment aboard.

"You probably recognize the urgency of the problem so I shall not attempt to underline that urgency further, other than to say that it is of the utmost importance," he ended.

Five minutes later the two conspirators were back in the engineering quarters, grinning like Cheshire cats, and mentally rolling up their sleeves to go to work. They had, to all intents and purposes, carte blanche to work out the construction of the device they would need for an enlarged Confusor with a real thrust, even though they would have to appear to co-operate with a multitude of other interested parties. Mike and Ishie were both becoming adept students of the mythical Dr. Confusion, and neither doubted their combined ability to handle that part of the problem.

"Now," said Ishie, "Confusion say he who can fly on wings of mosquito fly better on wings of eagle. How much thrust do we want, Mike?"

"What are our limits?" asked the practical engineer.

"Limits, schlimits. We got *power*. Of course," he added, "we *are* limited by the acceptable stress limits on the wheel, and . . . yes . . . by the stress limits on our plastic, too."

"The wheel was designed to stand upwards of 1.5 gee maximum spin—but that's only radial strength," Mike began figuring. "Don't think anybody ever calculated the stress of pulling the hub loose, endwise. No reason to, you know, and it wasn't expected to land or anything. And really, nobody expected it to stand in service more than a 1.5 gee spin on the rim. They computed these racks to take all kinds of shock, but the overall structure is rather flimsily build." He paused for thought. "We could maybe put a tenth of a gee on the axis, but I better check some of the stress figures against the structural pattern with the Cow first. We'll have to give some thought to strengthening things later, if we really want to go into the fantastic possibility of landing this monster anywhere."

Consulted, the Sacred Cow computed a potential maximum stress-safety at the hub of something over two-tenths of a gee, and the two finally settled on one-tenth as well within the limits.

"Now the other limit," said Ishie. "This little piece of plastic will only stand a pressure approaching the point at which it begins to distort and run out of the field. This stuff is quoted to have a compression-yield strength of one hundred ten pounds to the square inch. We probably shouldn't exceed . . . hm-m-m . . . ninety pounds. Let's get the Cow to tell us how big a chunk of surface area that represents."

The answer was discouraging. Mike rapidly converted the figure in centimeters to feet, and came up with nearly an eighty-three foot diameter for a circular surface.

"Looks like we'll have to put it out on the spokes," he muttered in disgust, but Ishie shook his head quickly.

"No need, Mike. Later on we'll need a few thrust points out on the rim for good aiming, but we don't have to have all this surface area in one unit or even in one place. Also, we do not need to consider only the surface of an homogenous piece of plastic material.

"This plastic can be cast. Very easily. In it, we can insert structures that will absorb the strain from many surfaces within, rather than only on a front surface.

"I expect some of the glass thread with which the hull of the ship was made could be inserted with no trouble. Each thread, then, would take up the strain, and a mass of them distributed through the plastic could deliver a greatly increased amount of thrust from a volume of plastic rather than from a surface area."

Mike started to object. "To get an absolutely parallel magnetic field, the gap between the pole faces can't be very wide."

"Perhaps I wasn't considering pole faces," Ishie answered. "Our investigation has already shown that once initiated the thrust-effect works best in a very low magnetic field.

"Such a low, parallel magnetic field would quite probably be found inside of a simple solenoid coil."

"O.K.," Mike answered, "but you have also found that a very high magnetic field is required to initiate the action. How do you get that inside a solenoid without an iron core?"

"As you say, a strong field must *initiate* the action. Let us try another experiment, Mike."

Ishie turned the Confusor off, selected a piece of wire from Mike's supplies, and wound a ten-turn coil over the large magnetic coils of the experimental device.

The leads from this he ran to a pulse-generator that could be accurately adjusted to supply pulses of anything from a tenth microsecond to a tenth second.

Selecting the shortest possible duration, he then set the magnetic field adjustment on the experimental device to a point just below that point on which it had turned on previously.

"Now we see." Turning on the device, he glanced at the display panel which still showed zero thrust. Then he triggered a single one-microsecond pulse into the additional ten turns of winding. The readout display showed zero thrust. He triggered a ten microsecond pulse. Nothing happened. One hundred microseconds. Nothing. One thousand microseconds—the display changed, dropping so quickly into position that the pulse thrust itself was not recorded—but the figure turned up seven hundred thirty pounds thrust on the display panel.

"So," said Ishie, "we can initiate thrust with a one thousand microsecond pulse. Can you design a power supply that would achieve that field for that time in a solenoid having . . . say . . . one per cent as high a field strength as the one we are using here?"

"O.K.," said Mike. "I get you. Sounds to me like this thing is going to look like a barrel when we get through with it.

"I wish," he added, "that we could get one point one gee. And land this thing on Earth. And have a big parade. with Space Lab One hovering just overhead to the cheers and the blaring bands and the—"

"Confusion say, he who would poke hole in hornets nest had best be prepared with long legs." Ishie grinned. "You don't think anybody would really appreciate our doing that, do you Mike? Outside of the people themselves, that is, that aren't directly concerned with man's *welfare*? We haven't done this in the proper manner of team research and billions spent in experiments and planned predicted achievements made with the proper Madison Avenue bow to the financier that made it possible. You know what they do to wild-haired individualists down there, don't you?"

Mike shrugged. "Oh, well," he said, "you're right of course. But it was a beautiful dream. How do you suppose we can build these and still keep all the scientists aboard and on Earth happy that they're just innocent magneto-ionic effect cancelers? Boy, that was a beauty, Ishie!"

"Best we have two sets of drawings. The ones for us can be sketchy, and need not have too much exactitude of design. We know what we're doing—at least, I hope we do.

"But let us make a second set of drawings that is somewhat different, though of a simpler shape and design, on which the other scientists aboard can speculate, and which can be sent to Earth to confuse the confusion."

The two went to work with a will, and as the two sets of drawings emerged, they were indeed different. The set from which they would actually work was only mildly described as sketchy. The papers looked like the notations a man makes for himself to get the figures he will set into a formalized pattern as it takes shape, before throwing his penciled figurings into the wastebasket.

The second set was exact; created with drawing instruments on Mike's drafting board, and each of the component circuits would have created an effect that would have interlocked in the whole, but it would take the most erudite of persons to figure each into its effect, and its effect into the whole, and the effect of the whole was somewhat that somebody might someday figure out—but would possibly cancel a magneto-ionic effect if such existed. The drawings looked extremely impressive.

As the second set of drawings neared completion, Ishie glanced at the clock, then turned to the Cow's vocoder.

"How soon will Space Lab One reach the northernmost point of her present orbit and begin a swing to the south?" he asked.

Mike looked puzzled, but the Cow answered, "In ten minutes, thirty-seven seconds. At precisely 05:27:53 ship time."

"I think," said Ishie, "we'd best put a switch on our magnetic field so that we can reverse the field and the thrust."

"Why?" asked Mike.

"Because," Ishie explained, "when we reach the top of our course northward, then the thrust of the Confusor and Earth's gravity come into conflict, moving our entire orbit off-center and bringing us closer to the pole. In not too many orbits, that eccentricity in our orbit might pull us into the Van Allen belt. We can't afford that. Now, if we reverse the thrust at the right time, our orbit will be enlarged and we stay out of troubled spaces."

Mike was still puzzled. "I don't see how that works," he said. "Why wouldn't we just go off in a spiral on our present thrust?"

"The acceleration of Earth is a much greater influence," Ishie tried to make it clear, "than our little mosquito here. As long as they work together, things go well. But when Earth dictates that we will now swing south, be it ever so few degrees south, our mosquito is overpowered and can only drag us clear to Earth-center on a closing spiral, which would eventually lead us to crash somewhere in the southern hemisphere, a good many orbits from now.

"I hope," he said, "reversing the magnetic field will indeed reverse our little mosquito's thrust." He moved toward the Confusor.

"Hold it," said Mike. "The displacement in orbit won't be very much, at least on the first few go-arounds, will it? And if we switch it now, somebody'll start getting suspicious of this magneto-ionic effect. The effect that's doing all this. A sudden reversal might not be in its character, if it had a character. And anyhow, we don't want to give another jerk on Hot Rod. We might jerk something loose this time. We've already wiped out Thule Base—and there's no use adding scalps to an already full belt."

"O.K.," said Ishie. "Then now, I think it is time that we presented our formal drawings to the captain; and I think that when we present them we will suggest that we start work immediately on construction, even while he is checking out our drawings through his experts, so that the project will not be delayed."

On the bridge, the captain received the drawings with relief.

"Thank you, gentlemen. If these prove out, you may have saved the satellite by the rapidity of your work. Dr. Kimball calculated that our present acceleration will take us dangerously close to the Van Allen belt in about three orbits, and I need not tell you what that would mean."

Ishie spoke up immediately. "In that case, captain, perhaps Mr. Blackhawk and I had better start construction on this device immediately, without waiting for you to complete the checkout. That may save us invaluable time."

"Of course," said the captain. "What assistance will you need?"

"Of the greatest priority," replied Ishie gravely, "is access to the machine shop. The solar flare should be about wearing itself out."

"Oh . . . of course. It may be." The captain's face was slightly red as he realized he had not thought to check this point. "Bessie, ask the computer . . ."

"Yes, sir," she answered quickly, and returned shortly. "The computer says the radiation count is down to ten M.R. above normal."

"It's a fairly low reading, even if it is above the Cow's normal-safe mark. That reading could go on for hours, which we may not have," commented Ishie. "Perhaps we could disregard so narrow a differential . . ."

"In your opinion, doctor," the captain asked, "would it be safe to return the personnel to the rim? Of course, I would have to return the entire ship to normal conditions in order to give the machine shop or any other part of the rim its normal six-foot shielding," he added, "so please consider your answer carefully."

"I think you would be quite safe to do so, captain. Considering the fact that otherwise we may go into the Van Allen belt, I think it should be done without question."

To himself, Mike chortled gleefully. This grave, pedantic physicist was about as unlike the co-conspirator with whom he had worked for the past nearly ten hours as was possible. "The guy's a genius at a lot of things," he thought to himself. "Puts on the social mock-up expected of him like you'd put on a suit of clothes—and takes it off just as completely," he added as an afterthought.

The return to the rim was slower than had been the evacuation—but it was complete within twenty minutes of the decision to return the satellite to normal.

In the machine shop, Paul and Tombu, with Ishie and Mike, were gathering the materials they'd need for the odd construction—Paul singing to himself as he worked.

"I got in the shuttle, thought it went to the Base;
"I'd learned my trade; there I'd take my place
"Safely on Earth; but I found me in space—
"I'd went where I wasn't going!"

"What's that song? asked Ishie of the spaceman.

"Oh, that's just 'The Spaceman's Lament.' You make it up as you go along." His voice grew louder, taking the minor, wailing key at a volume the others could hear.

"I got on the wheel, thought I'd stay for the ride—
"I'd found a funny suit in which to hide—
"But I went through a closet—and I was outside!
"I'd went where I wasn't going!"

Tombu and Mike joined happily in the chorus, bawling it out at the top of their lungs as they began the work that would make the big Confusor.

"Oh . . . there's a sky-trail leading from here to there
"And another yonder showing—
"But when I get to the end of the run
"It'll be where I wasn't going!"

Meanwhile, facsimile copies of the official drawings had been made for the other interested scientists aboard, and also sent by transfax to U.N. headquarters for distribution among Earth's top-level scientists.

They were innocent enough in concept, and sufficiently complex in design to require a great deal of study by these conservative individuals who would never risk a hasty guess as to the consequences of even so simple an action as sneezing at the wrong time.

Major Steve Elbertson awoke with a start, to see a medic's eyes inches from his own. For a moment, fearing himself under physical attack, he struck out convulsively, and then as the face withdrew he sat up slowly.

He was slightly nauseous; very dizzy; and his instincts told him that he needed a gallon of coffee as soon as he could get it. Then the medic's voice penetrated.

"Please, sir, you must rest. No excitement."

Almost, he was persuaded. It would be so easy to relax; to give someone else the responsibility. But the concept of responsibility brought him struggling up again.

Hot Rod was a dangerous weapon. He could *not* act irresponsibly.

"How long was I out?" he muttered.

The medic glanced at the clock. "Just over nineteen hours, sir."

"Wha-at? You dared to keep me off duty that long? I must report for duty at once."

"Please, sir. No excitement. You must rest. Just a moment and I'll call Dr. Green." With that the medic turned and fled.

As Dr. Green approached, Steve Elbertson was already on his feet, swaying dizzily, white as a sheet, but perhaps the latter was more from anger than from anything else.

"Major Elbertson. You received a severe dose of radiation. You are under my personal supervision and will return to bed at once."

"Is the flare over?" Elbertson asked the question, although already vaguely aware that the ship was again spinning, that he was standing on the floor fairly firmly, and that, therefore, the emergency must be over.

"Yes."

"In that case, sir, my duty is to my post on Hot Rod."

"Hot Rod's out of commission and so are you. I cannot be responsible for the consequences if you do not follow my orders."

"Explain that, please. About Hot Rod, I mean."

"Why, it was struck by a meteor shortly after the flare last night. I think I heard someone say that it burned out Thule Base before they managed to turn it off."

Without waiting for more, Elbertson brushed past the doctor and headed for the bridge.

The captain was startled by the mad-looking, unshaven scarecrow of an officer that approached him, demanding in a near-scream, "What happened? What have you done? What did you DO to Project Hot Rod? No one should have tampered with it without my direct order! Captain, if that mechanism has been ruined, I'll have them nail your hide to the door!"

"Major!" The captain stood. "This may be a civilian post, but you are still an officer and I am your superior. Return to your quarters and clean up. Then report to me properly!"

For a moment there was seething rebellion on Elbertson's already wild features. Then, automatonlike, he turned and walked stiffly away without saluting.

But the stiffness left him as he passed through the door. Momentarily he sagged against a wall for support, far weaker than he thought possible for a man of his youth and what he thought of as his condition. Making his way almost blindly to Security's quarters in rim-section B-5, he staggered through the door and on towards the latrine, shouting at Chauvenseer to "Get out of that sack and give me a detailed report on events since the flare. Oh, and send somebody for coffee—lots of coffee."

On the bridge the captain flipped the intercom to Dr. Green's station. "Is Major Elbertson under the influence of any unusual drugs, doctor?" he asked when he'd reached the medical staff chief. "Anything that might make his behavior erratic?"

"Only sedatives, captain. And, oh yes, those new sulphhydral anti-radiation shots. We're not too familiar with what they do, though the reports indicate the worst effect is a mild anoxemia, which generally results in something of a headache. Of course, that's if the quantity of the drug was precisely calibrated. They can be fatal," he added as an afterthought.

"Would anoxemia cause a change in character, doctor?"

"It might. It might make one behave either stupidly or irrationally—temporarily or permanently, depending on the severity of the effect."

"Did Major Elbertson seem normal to you when you discharged him from hospital?"

"I did not discharge him, captain. I ordered him to remain under my care. But he seemed greatly upset, and short of force I could not have kept him from leaving."

"I see." The captain paused, then asked: "Doctor, please consider carefully. Would you consider Major Elbertson's condition serious enough to warrant confining him to bed by force?"

"Probably not. He should come out of it in a few hours. Exercise may possibly be good for him, though I doubt if he's capable of much of it." The doctor chuckled as though at a private joke with himself, then added, "He's really quite weak physically, you know, even without the after effects of radiation and drugs."

"Thank you, doctor."

Back in his quarters, Elbertson was refusing to admit to himself the fact of his own weakness. He had been quite ill in the shower, had managed to slash himself rather badly with the razor while shaving, but was now smartly attired in a clean pair of the regulation coveralls, with the insignia of his rank properly in place—and so weak he could hardly move.

The coffee hadn't helped much.

The briefing had helped even less. The major knew himself guilty of negligence while on duty. Inadvertently, but as though by his very hand, certainly through the agency of some saboteur he had failed to spot, his weapon had been turned on his own troops at Thule, key post in the plan.

It was possible that the entire plan had been sabotaged, though that seemed quite unlikely. Its ramifications were too great. So long as Hot Rod still existed, was still within their reach, the plan was operational.

The nonsense about a magneto-ionic effect he discarded without hesitation. Obviously it was sabotage, possibly by someone with a plan of his own, more probably by someone in the pay of one of the big power companies that would like to see the operation at least postponed. Obviously—he gave up.

Nothing would be obvious until he knew in exact detail what had occurred, what the plans of the enemy would be, where next they would strike—and who was the enemy.

But that last, at least, was almost obvious. Who else, but the man who had carried the political battle, against all odds, that Hod Rod be created? Who else but Captain Naylor Andersen could possibly have delivered this sneaking, underhanded attack against himself and his comrades?

Who else, he thought, but a man so callous as to order *him,* sick as he was, as though he were a mere cadet, to leave the bridge.

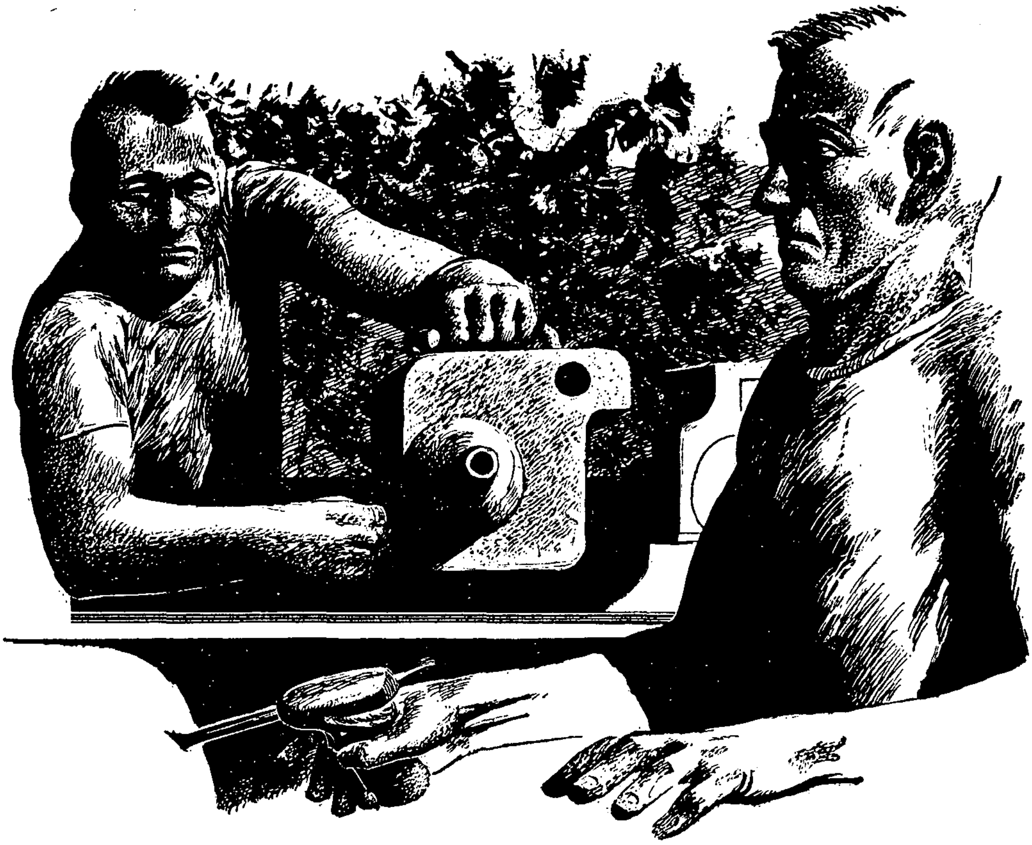
Major Elbertson's mind was made up as to the identity of the enemy.

But he would have to proceed with care, or he would key the plan before the time was ripe. There must be no great shake-up in personnel, or undue attention from Earth to the potentials of Project Hot Rod.

Perhaps the saboteur's cover-story of a magneto-ionic effect would serve his ends as well—at least until his comrades on Earth signaled that the time was ripe.

Yet now that Hot Rod had proved its power, the time *was* ripe. It was that proof on which the plan had waited. And perhaps this very sabotage would prove to the "incident" on which the plan hinged . . .

Even as he fought to clear his normally organized mind



of the weariness of his body that now sapped at its strength, the call came.

Chauvenseer appeared at his side, saluting smartly. "Com Officer Clark, sir, reports a message from Earth. *The* message, sir. 'Begin Operation Ripe Peach.' "

Major Elbertson pulled himself to a military stance, returning his aide's salute with complete precision.

Briefly he considered gathering all his men, all the Security personnel, and storming the bridge.

No, obviously the enemy was organized—an unforeseen circumstance. Obviously the captain was not alone. Obviously *his* men included at least some of these slipstick boys—and he would command the loyalty of them all, since he was somewhat of their ilk himself.

No, an officer must seek the most advantageous position from which to deliver his ultimatum.

He must use Hot Rod itself to control them. If Hot Rod itself were actually sabotaged, then the plan must wait until he could have it repaired. He doubted it was hurt.

The flare had thrown off all original sequences—but perhaps that was to his advantage.

To Chauvenseer he snapped: "This is the detail of our immediate operation. Get four of our best men besides yourself. Have each of them come separately and unobtrusively to the south polar lock, where I will meet them. I will bring Smith with me.

"Have each of the others take his assigned post for Operation Ripe Peach—but order them to take no action other than to prevent anyone on board from doing anything unusual that might be an enemy operation—until I alert them that Operation Ripe Peach is operational.

"Their orders will, of course, come on our personal radios, Security Band 2Z21.

"Execute!" he ended, saluting smartly.

As the Security squad moved, with individual secrecy, towards their various posts, Captain Andersen was considering that Elbertson would probably snap out of it as soon as he had had coffee and a shave. The man had probably been severely affected by the drugs he had been given. He would make no further reference to the incident of erratic behavior, unless it continued.

Bessie, having at the moment nothing else to do, was busily plying the Sacred Cow not only for her own horoscope for the day, but also those of the several persons of whom she was most fond, while carefully keeping a shielding bunch of paper work in a place to make it appear that she was officially busy. The captain's horoscope, she recognized, didn't look much worse than the rest of them, but was definitely the worst. One of those mathematical jumbles that somehow didn't interpret clearly. None of them looked very good today.

Out on the rim, things were getting back to normal. The labs were functioning again, most of them according to their assigned, routine procedures; but in some, heads were drawn together over the absorbing diagrams supplied by Mike and Ishie.

Mike and Ishie themselves had already put in twelve hours almost without a break. Working under stress, neither of them had remembered to eat.

There was a cough at the entrance to the machine shop, and Dr. Millie Williams' soft voice said "May I come in?"

The two looked up as the slender figure of the dark-skinned biologist entered the lab, balancing "trays" with plasti bottles atop.

"If I know you, Dr. Ishie; and you, too, Mike—you haven't eaten," she said with a smile. "Now, have you?"

"Millie," said Mike, "you've just reminded me that I'm as hollow as a deserted bee-stump after the bears get through with it!"

"Little Millie," said Ishie, looking up at the figure nearly as tiny as his own, "you must be telepathic as well as beautiful. Confusion say 'Gee, I'm hungry!' "

"I'm told that the fate of the satellite depends on you two," Millie smiled. "I thought I'd just give our fate a little extra chance. Now drop what you're doing and light into this.

"After that, if you've got a job for a mere biologist, I've got my lab readied up where it can last till I get back and—I'm not bad with a soldering iron. Meantime, why don't you let Paul and Tombu go eat while you eat?"

"Good idea," said Mike. "You two. You heard the lady. We gotta give our fate the benefit of victuals. Scat."

As soon as the physicist and the engineer were settled to the plastic containers of food and coffee she had brought, wolfing them down hungrily, Millie opened up.

"While we're alone, I'm going to speak my piece," she said. "You two will do me the honor of not taking offense if I say that you have the most brains and the least consciences aboard—and I happen to share the latter characteristic."

The two looked up guiltily and waited.

"Now don't stop eating, for I'm not through talking," she said. "That magneto-ionic effect canceler you dreamed up would probably cancel the six hundred forty pound magneto-ionic effect pull you dreamed up—if such a thing existed.

"What I want to know . . . don't stop eating until you've decided whether you're going to let me in on your game or not . . . is what really does exist? I might be of some help, you know."

"But—" Mike and Ishie simultaneously choked over their food, looked at each other, and then Mike blurted out, "but how could *she* know?"

"Don't worry," said Millie. "I'm probably the only one. It takes a person with little conscience and much imagination—takes a thief to catch a thief, I mean—yes, I think I mean that quite literally. Besides, I can help with some of that glassware that disappeared out of my supplies several days ago. Oh yes, I knew it was gone and where it went—but I figured any purpose you had was a good one, Ishie.

"But for how I personally canceled the idea of your magneto-ionic effect from the flare—it just happens that last night I was curious while everybody was asleep. When Bessie first came on duty this morning, I offered to relieve her while she had a cup of coffee, and I got a half-hour all by myself with the Cow. The captain wasn't up yet. Her console's so simple anyone with a basic knowledge of computers and cybernetics could figure her out.

"Practically the first question I asked—something about our orbit—the Cow told me that the information was top secret, and to get it I must go to the proper channel and identify myself as Mike. I started to intercom you, Mike, to tell you that your machinations were showing, but Bessie came back about them. I hung around to see what would happen, and pretty soon Bessie asked the Cow about the same question—but instead of getting the same answer, the Cow told her that an external magneto-ionic field was pulling us out of line.

"So I went up to your engineering place. I rather thought you'd like to know what the Cow had told me—but Dr. Ishie was there, and so instead I went about my own business until I could figure things out.

"Now I couldn't figure things out. But I could figure there's a monkey wrench somewhere—and since the two of you have been sticking together like Siamese twins, I know it will be perfectly all right to ask you in front of Ishie.

"Now," she finished, "do I get my girlish curiosity satisfied? You don't have to tell me. I'll just keep on being puzzled quietly and without indicating the slightest magneto-ionic dubiousness, if you'd rather. But I might be helpful; and I *would* like to know."

"Confusion say," Ishie declared through the side of his mouth, "that he who inadvertently puts big foot in mouth is apt to get teeth kicked loose. We are very lucky, Mike, that it was Millie who asked the question of the Cow at that time. Besides, we've got to tell somebody sooner or later. We can't just run off by ourselves.

"Yes, Millie, I think you have a job," he said. "Your help here will be appreciated, of course. But what we really need is a way of bridging the gap between ourselves and the rest of the personnel before it gets too wide. How's your P.R. these days?"

"That's something I learned in a hard school, public relations," she answered nonchalantly. "De-segregation was just beginning when I was a girl back in Georgia. But maybe I'd better know what the gap is."

The two began to talk, interrupting each other, incoherently outlining the Confusor and the various forces it exerted, and the—what Mike kept calling the inertial fish hook.

Finally Mike took over. "To put it simply," he said, "our pet didn't do at all what we expected—it hooked in on inertia and it took us off. A confusing little Confusor—but Millie—it's a space drive! A real, honest-to-gosh space drive!"

Millie gulped. It was far, far more than she had expected. Perhaps this was another form of disguise like the magneto-ionic . . .

"Are you sure?" Then she answered her own doubts. "Of course you're *telling* the truth now. That's not something you two would play games about." Then in awe—"You've really got it!"

"But why, then," she said, uncomprehending, "are you hiding it? But before they could answer, she answered her own question again. "You'd have to. Of course. Otherwise it'll be strangled in red tape. Otherwise nobody'll let you work on it any more, except as head of a research team stuck off somewhere. Otherwise, Budget Control would take it over and make a fifteen-year project out of it—and the two of you will probably have it in practical operation . . ."

She looked at the molds and wiring taking form all across the machine shop.

"Oh, no! You'll have it in operation—soon!"

"Yes, soon—and we hope soon enough." Ishie sighed, then grinned impudently. "There is," he said, "the little *matter of the fact that—in all innocence but nevertheless* quite actually—we wiped out Thule Base.

"If we don't get the big Confusor in operation very soon, it may be that we shall spend a good deal of time in Earth's courts proving our innocence while someone else botches most thoroughly the job of creating a Confusor that could take us to the stars. And that," he added mournfully, "neither of us would enjoy. We might not even be able to prove our innocence, for there would be many very anxious to prove us sufficiently guilty to keep us out of the way for many years.

"So you see," he said, "you have a very real P.R. problem. Our assistants here could work better if they knew what they were doing. The people aboard the wheel would be most excited by a space drive, and would give us every aid.

"But what the law says, it says—and the captain would *have no choice but to put us in irons if he heard, though* I think our captain is such that he would not want to do it.

"We must tell everyone what we have, for where the wheel takes us, they will go. But we can't tell them, for if we tell anyone, it will get back to Earth—and we murdered Thule, according to the law of Earth.

"It is a very neat problem," he said.

Major Steve Elbertson arrived first at Project Hot Rod, and trailing behind him on their scuttlebugs, the other six men.

As he slipped through the lock and out of his spacesuit, he reached down the neck of his coveralls and carefully extracted the Security key in its flat, plastiskin packet, from between his shoulder blades. At least the villainous captain had not gotten his hands on this, he thought, and whatever damage had been done to Hot Rod probably could be quickly repaired.

He had heard of the hunt for the key, and been silently amused, though he had volunteered no information to his briefing officer, Chauvenseer.

Stepping forward as briskly as a sick rag doll, he fitted the key into the Security lock and snapped open the *bar that prevented Hot Rod's use.*

As the others entered, he turned to them. Supporting himself against the edge of the console and managing to look perfectly erect and capable despite his weakness, he said: "I have instructed each of you to learn as much as you could of the operation of this device. It is now necessary that the civilian scientists," he pronounced the "civilian" as though it were a dirty word, "be relieved of their rule over this weapon, and that the military take its proper place, as the masters of the situation. I trust each of you has learned his lessons carefully, because it is now too late for mistakes—although we have with us assistance far superior to that of the civilians.

"Gentlemen," he said, and his voice took on power as he talked, "it is a pleasure to re-introduce to you a companion whom you have known as Lathe Smith.

"This, gentlemen," he said formally, gesturing one of *the men forward, "is the Herr Doktor Heinrich Schmidt,* of whom you would have heard were you familiar with the more erudite of the developments of space physics.

"Dr. Schmidt," he added, "it is a pleasure to be able to again accord you the courtesies and respect that are your due.

"Now for myself," he continued, "it may surprise you to know that I, too, have a somewhat more advanced rank than you have suspected." Deliberately he unpinned the major's insignia that he wore, and brought out a sealed packet, opened it, and pinned on four stars.

"Gentlemen," he finished, "may I introduce myself? General Steve Elbertson, commanding officer of all space forces of the United Nations Security Forces.

"Now," he said briskly to his astounded men, his voice crackling with authority, "take stations.

"Dr. Schmidt will key in the number one laser bank *only. You will select as your target area that area through* which the passenger spokes of the wheel pass. These will each in turn be your targets if it becomes necessary to fire.

"Dr. Schmidt has advised me that, should it become necessary to fire on the hub, the resultant explosion of the shielding water will wreck the big wheel.

"If we should miss and hit the rim, the resultant explosion would inevitably wreck both the big wheel and Project Hot Rod.

"Therefore, gentlemen, I caution the most accurate possible aim.

"And Dr. Schmidt, will you connect the storage power supply you have readied, please?"

Quickly then, he slid into the communications officer's seat, as the Security officers assumed each of the four major posts of the project, while Chauvenseer took up a stance at his general's right hand, ready to respond as directed.

On the bridge, Captain Nails had been annoyed. Too many queries from people who really didn't have authority over his satellite. Too many directives and counter-directives were flooding at him from various officials on Earth.

Some one down there even had the temerity to suggest that Security take over—not officially, just sort of take over.

If that didn't take the cake, he thought. Trying to put that crumb Security officer into command, *real* command, of a scientist? Over HIS people? Never!

And just because somebody had a wild idea about sabotage—after all, the whole thing must be some sort of effect or accident. Why couldn't they leave people alone long enough to find out what was really going on?

And where was Elbertson, anyhow? The man had had plenty of time to freshen up. Possibly he had caved in some place. The medic had said he was sick. But even so, I'd best check, he thought.

Reaching for the intercom switch that would give him a private line to Security quarters in the rim, his gaze happened to fall on the panel that still displayed Hot Rod on its taut cable—

—And seven figures riding the end of the cable to the air lock.

Elbertson, of course, he thought furiously. And taking his men out when the proton level was still too high to go beyond the rim shielding . . .

Then the captain stopped in mid-thought. This was no idle act of a man feeling the effects of drugs.

He switched the intercom quickly to the Hot Rod crew's quarters on the rim. "Dr. Koblensky!" he almost shouted into the mike.

"Just a minute, sir," came the answer, and seconds that seemed like eternities passed before the doctor's calm voice answered, "Dr. Koblensky speaking."

"Did you know that seven men were going out to Hot Rod?"

"Of course not. They mustn't . . ."

The captain switched off and changed to the intercom for the machine shop. "Dr. Ishie. Mr. Blackhawk. To the bridge on the double. *Fast*," he said.

It might not be the saboteur, he thought, but the chances looked grimly real that Earth was right—that the whole thing was sabotage, and those were the seven saboteurs. While he waited, he checked the Security quarters for Elbertson. The major was not there, nor was he in hospital.

Elbertson, he thought. I've been blind.

He decreased the magnification of Hot Rod so that the entire project showed.

Mike arrived first, almost skidding to a stop at the captain's console, Ishie right behind him.

"The saboteur—seven men that I believe to be saboteurs—are aboard Hot Rod," the captain told him crisply. "Can they activate it?"

"Captain, there's no saboteur . . ." Mike began, but the captain interrupted.

"Gentlemen, I'm not asking you to be the judge of that. If they are saboteurs, is there any way that they can activate Hot Rod?"

"Oh, they could have storage batteries aboard, I suppose." Mike didn't even pretend to be excited.

"Then we will assume they have, Mr. Blackhawk." The tone of the captain's voice told Mike he'd better darned well believe in those saboteurs or tell the captain the truth—and that quickly. "Now, assuming Hot Rod can be activated, we will also assume that their first aim will be to control the wheel. They would, therefore, aim at the hub and issue an ultimatum."

"They might aim at a target on Earth, and issue an ultimatum to us." Mike would play the game.

"No. We would refuse such an ultimatum. They would aim at us. Can you prevent that?"

Mike thought hard. He'd better come up with an answer to that one, saboteurs or no.

"If they shot through the hub, they'd hit our shielding water and explode the hub-hull. That would wreck the wheel, and they'd need the wheel. The only place they could safely shoot us would be the passenger spokes, and that would take some pretty fine target shooting—with only one laser bank. They could do it though," he said thoughtfully.

"Assume, Mr. Blackhawk, that if they couldn't hit the passenger spokes, they'd be willing to destroy the wheel in order to gain control. Is there any way to prevent that?"

Mike stood completely silent for almost a minute. Then he grinned. "Sure," he said. "If we turned the rim towards Hot Rod, they couldn't fire into the rim without hitting that shielding—and that would create an explosion, even from their smallest possible shot, that would almost inevitably take Hod Rod with it. If we turn the lab so that only the rim is toward Hot Rod, it's suicide to shoot us."

"You will swing the rim of the wheel into that alignment as rapidly as it can possibly be done." The captain's voice practically lifted the two men off the bridge, and they were on their way to the engineering quarters with every appearance of the urgency they should have felt if they had not known who—or rather what—was the real saboteur.

Then Mike heard Ishie's soft voice from behind him, slightly breathless. "At that, you'd better swing the rim and swing her fast, Mike. The captain sure 'nuff believes in his saboteurs, and it's just possible they're real."

O.K., thought Mike, and really moving now he reached the engineering quarters a good ten strides ahead of his companion.

As he entered the open bulkhead lock he saw a man that he recognized as one of the Security personnel, and brushing on past him said, "If you want to see me, come back later. I'm going to be very busy here for a while."

Mike headed for the panel that controlled the air jets and other devices that spun the wheel.

The Security man didn't hesitate. Seeing the ship's engineer about to make important—and possibly subversive—adjustments, he drew his needle gun and aimed it squarely at Mike's back. "Halt—in the name of Security!" he barked.

Slowly Mike swung around, eying the man coldly, and began a question.

But there was no need. Dr. Chi Tung, having seen what was going on through the lock before he entered, had held back just long enough for the Security man to turn fully towards Mike. Now he launched himself through the lock like a small but well-guided missile, and arriving on the Security guard's back, had his gun-arm down and half broken before the man knew what was happening. Had he been alone, it is possible that the larger man might have won. But Mike had never been fond of people who pulled guns on him, even if they were only sleepy guns.

Between the two of them, the Security guard was lucky not to lose his life in the first two seconds of battle.

The conflict ended almost before it had begun, with a meaty slap of Mike's fist connecting with the man's jaw, right below the ear. It hadn't been a clean punch, Mike thought, but then he wasn't really used to fighting in this gravity. Anyhow, the man was out.

And now came the question of what to do with him, but Mike left that to Ish.

He turned back to the precession panel a bit more convinced that perhaps the captain had been right—perhaps there were enemies aboard.

The precession controls, though operational, had not to date been required. Carefully, Mike switched the sequence that would put them into active condition but not operate. That was left to the Cow.

Turning to the vocoder panel, he directed the Cow to take over control of the now active precession equipment; to use the sun as a referrant for the axis of precession, and to move the pole ninety degrees in a clockwise direction around that axis of precession.

Under these directions, the big wheel began to turn, not as it had been turning, but sideways. The operation would take ten minutes, and the axis of this new turn would be aligned directly on Sol by the computer.

The Cow's help in such a maneuver was required, because the precession could only be accomplished by switching valves between the tanks of the rim in such a manner that water was switched north on one side of the wheel, and south on the opposite side of the wheel, and the points of this switching between tanks must remain in a stable position relative to the spin of the wheel. The valves that accomplished this, seventy-two of them, were spaced at intervals of five degrees around the rim, but only two out of the seventy-two could be active at any time; and these must be selected by the computer's controls so that always the precessive force was properly aligned to produce the required precession.

When the precession was finished, the rim of the wheel would be aligned, still with the sun, but also with Project Hot Rod which had been to their south.

As a third thought, Mike switched off the Confusor.

Having set up the necessary factors, Mike turned back to the problem of the Security guard, or saboteur, whichever he might be, but found this problem had already been well taken care of. Not satisfied with simply tying the man up, Ishie had bound him with wire to somewhat the resemblance of an Egyptian mummy, and then for added good measure, given him two sleepy shots with his own needle gun; put electricians tape across his mouth; and taken from him everything he could possibly use either as a method of communication or as a weapon.

At least, Mike thought, Ishie is a thorough workman when he sets his mind to it.

Having parked the Security man in a nearby tool locker, with the feeling that he would keep for a while there, Ishie turned back to Mike with a grin.

"Confusion say those who play with firearms should be cautious! Mike, this convinces me. I've heard snatches of what's going on on Earth, and it looks like sombody is putting over a fast one down there. Seems like maybe our own Security boys are part of it. They would be the ones the captain saw going out to Hot Rod. And that means they've got a purpose out there. Is good to know they can't shoot us now, at least in a few minutes now, without getting themselves shot back. But they can shoot at Earth. Any ideas?"

"Well . . . I thought some time ago that there was a little fallacy involved in that project when I saw how they hung the beam-director way out in front on those little

old balloon-poles. They've got 'em bent, and if any one or two of 'em should happen to get punctured, the other two would move the mirror complete out of the laser beam focus. Then the only thing they could shoot would be the sun—and I don't think it'd care.

"Ishie, you stay here just to keep the home fires burning and make sure that nobody fiddles with anything we don't want 'em to. All of the bulkheads leading into this section can be locked from the inside—a feature I haven't seen fit to point out to other people who really don't need to know."

Walking around the floor, Mike carefully secured the four bulkheads, two leading back to the morgue; two leading forward to the north pole end of the hub. And then, jumping catlike upward and grasping the access ladder to the central axis tube, he carefully bolted that one, too.

Dropping back to the floor he stepped over to the intercom and switched in Captain Nails' circuit.

"Mission accomplished, sir. And you were quite right. One of our *Security* servos is off balance. I'm attending to the matter."

"Thank you, Mr. Blackhawk." The captain's voice was calm, quite unlike the voice he'd used to them on the bridge. "You would do well to listen for the . . . sound . . . of those servos." The captain's voice stopped but the intercom continued to hum, alive from his end.

"Ishie," said Mike, "the captain's in trouble, and he's asking us to listen in on what goes on the bridge. He's left his intercom open.

"Now I've got a mission to accomplish; and you can't leave here, because this post's got to be operational. But you can listen and do whatever the captain tells you.

"And, Ishie—if anybody takes the bridge away from the captain, you tell the Cow not to obey any orders or answer any questions unless they come from here."

With that, Mike leaned over, loosened an inspection plate in the floor, and climbed down a ladder through the inspection tube that led through the six feet of normal-shield water directly beneath the floor into the seventeen-foot flare-shielding chamber beyond. This was the tank which surrounded the hub and held all of the waters of the rim during flare conditions; but was now holding only the air supply which, during a flare, was pumped to the rim.

Making his way back towards the center of the hub, Mike considered his luck in being one of the people most familiar with the entire structure of the ship. It would be unlikely that enemies operating aboard would think to cut off the air and water passages, or even keep them under surveillance. Nevertheless, he would be cautious.

He must now get to the machine shop, and enter it without triggering any more of those—he laughed quietly to himself—Security servos.

The particular tank he was in he had selected carefully. Of the twenty-one possible combinations, this one he knew would bring him into the water under the north hall that circled the outer rim.

In a few strides he reached the three-foot-diameter spoke tube through which the flood of water would pour during a draw-in action such as that they had had during the flare; let himself over the side head first, let go and began falling down the seventy-nine foot length of the tube, accelerated by the light pseudo-gravity of the spin. Even so, he spread his legs and arms against the walls of the tube to act as a brake, so as not to arrive with too much impact at the bottom of the tube.

As he hit the water at the bottom, the tube swung around the circumference of the rim to the point at its far side at which it entered its particular river.

The course of his dive carried Mike to the bottom of the curve, and he started crawling up its far side to where the tunnel entered the rim-river. There the motion of the fluorescent-lighted water caught him, and he was swirled quickly to his target, twenty-five feet along, inspection plate B-36. He grabbed the handhold by the plate before he swirled past, loosened the plate, lifted it only enough to be sure that the room was empty, and then pushed it off, pulled himself through, and emerged into the whining dimness of Compressor Room 9, next to the machine shop. The low whine assaulting his ears was that created by the air compressors that fed the jets that drove the waters through the rim.

Stepping over to the wall locker, Mike took out a dry pair of shorts, a T-shirt, and moccasins, kept there for the purpose of making changes after such swimming inspections of the rim tanks.

Before entering the machine shop, Mike spotted the Security man through the open bulkhead — just standing there while Paul and Tombu grimly worked on; and Millie sat idle, watching.

Mike entered the machine shop casually, as though intent on business, brushed past the Security man, and stepped over to the tape-controlled, laser-activated milling machine as though to inspect its progress.

Then, as though finding an error, he halted its operation and swung the laser-head back away from the work piece.

The head swung free in his hand, attached to the machine but nevertheless free. Casually, without even looking at the Security man, he had somehow centered the laser directly on him. Just as casually, he stepped to one side.

"The beam from this machine is quite capable of milling the hardest materials," he said, still casually, as though to himself. "Even a diamond can't withstand it."

Now he looked directly at the Security guard. "It's capable," he said in an even tone, "of milling a hole right through your guts if you even so much as breathe too deep."

Then to Chernov. "Move around behind him, out of range of this beam, and secure the man, please. Millie, is there any thing in your department that will make sure he won't talk for a while?"

"Yes, Mike, but I don't think I'd better go there right now. There aren't many of them, but these boys seem to be spread out all over."

Chernov had the gun now; and the personal communicator from the Security man as well.

"O.K.," said Mike. "I don't think he can give us much trouble in there," pointing at the air-lock bulkhead through which he had just entered. "We can go in and out through the physics lab," he said. "Best we shut that off now before some more of these boys wander along."

When both the lab and the Security man were under control, Paul Chernov turned to Mike. "That milling-laser," he said. "It's got a focus of about six inches maximum. How did you fix it so it could burn the guard at that distance?"

"I didn't," said Mike briefly. "He already knows that lasers can reach from here to Earth. Why should I bother to tell him any different?" Turning to Tombu he handed him the Security man's radio. "See if you can rig this," he said, "to broadcast everything they say over the general intercom channel. It's about time we let people know what's happening."

It took Tombu only minutes to hook in the radio. As he turned it on, Elbertson's voice came over the loudspeaker system. A roll call of Security men was apparently being completed. The last three men responded as called.

Then Elbertson's voice, crisp but somewhat labored, came over the Security beam, booming throughout the ship. "It is obvious that the renegade scientists and engineer of the wheel have replaced the men guarding their sectors.

"As we were informed, the captain had put them in charge. Since they struck the first blow, it is now up to Security to converge on them and eliminate them.

"Jones, Nackolai and Stanziale are detailed to the Dr. Chi mission. Nilson, Bernard and Cossairt are detailed to get the Indian. The rest of you will take over where you are posted, and secure all personnel to their quarters.

"Clark. Drop your cover and take over control of the bridge.

"I expect to have Hot Rod operational within five minutes. And Clark. Instruct the computer to discontinue precession operations that have been initiated.

"Take whatever measures are necessary to carry out these instructions.

"This is no longer an undercover operation, gentlemen. Security is taking control.

"This is war."

As the last sentence came over the loud-speaker, Mike sprang to the intercom. He quickly keyed the direct line to engineering.

"Ishie," he said, "I gather you're safe?"

"Yes, Mike. Situation here very secure. I heard announcement of conflict. You need not tell me to put the Cow under our control. It is done. She will obey no one else until further instructed from here. I didn't instruct her to obey only instructions by me, Mike, because we are all expendable now."

As he finished speaking, the intercom went dead. Obviously the communications officer, as his first act, had turned off the central intercom power system under his control.

On the bridge, from the time that Mike and Ishie had left, the picture of what was occurring had grown more ominous by the minute.

More than the vague, official messages had been flooding in from Earth.

At the captain's command, the communications officer had opened up a channel for news broadcasts, and put it on the speaker so they could all hear.

The news round-ups indicated that various elements and factions in the world below had had their say—each more vicious than the last.

From an original rumor of a minor space disaster, it had become a tremendous accident that had wiped out Thule Base and left a smoking ruins of Greenland.

From this it had become—possible sabotage.

From this, a direct, unprovoked attack by the scientists on Earth itself.

Suddenly statesmen were standing forth in the U.N., condemning the actions of country after country that had made possible the great wheel; and just as suddenly, word had been announced:

Earth would be protected. The U.N. would act.

The U.N., it suddenly was found, controlled the majority of all weapons on Earth; controlled the majority of all armies, navies, and all stockpiles of ships and planes and ammunition that it had so boastingly told everyone that it had scrapped.

The honeyed phrases of a few years before that there would always be peace on Earth, and that the U.N. had taken the bite out of war, changed; and the individual nations were now forgotten.

Now the U.N. itself was the military power; and now it would be U.N. telling others what to do.

Mobilization would be declared. A war footing for the economy. Everyone must fight back against the insane scientists above with their inhuman weapon.

With appalling swiftness, where apparently nothing had been before, a military force stepped forth in full armor to grind man's hopes for freedom under an iron heel while waving its fist at the stars.

At first there had been voices crying out against this monstrous action, this unbelievable birth, in the U.N. Assembly. But the voices had become fewer and fewer, weaker and weaker, and in a matter of hours had been drowned out.

Amazingly, even now, there were one or two who stood up in an attempt to stem the tide; but they were ignored, and a ninety-eight per cent favorable vote was cast.

The U.N. Security Forces had been granted dictatorial powers.

For the "duration of the emergency."

The die was cast, and the yoke fitted, ever so snugly but firmly, across mankind's back, while he cheered the fitting.

Captain Nails Andersen sat stunned at his console.

The communications officer sat back, paying little attention to the board before him, a light smirk on his face.

But the smirk dropped from his face suddenly. Rising over the background chatter of the radio announcements from U.N. Headquarters, came loudly over the ship general intercom the voice of Major Steve Elbertson, counting down through the list of Security personnel.

He, too, sat stunned until, as the voice ended "This is war," he came to, stood up needle gun in hand, pointed at the captain.

"I don't know how your slipstick boys cracked our code and picked that message up," he said, "and I don't really care. As you heard, the major has ordered me to take command of the bridge. I hereby do so."

Coming through the bulkhead were two more Security men, each with a needle gun. His gun unwaveringly pointed at the captain, Com Officer Clark reached down and flipped the red switch that turned off the power to all of the ship intercoms.

On board Hot Rod, the Security crew was working against an accelerated time-schedule now. The aiming controls of Hot Rod's big mirror were infinitely precise—and correspondingly slow. As soon as the storage power supply had been wired into the big weapon—a precise operation, requiring both skill and time—the factors had been keyed in that would bring the mirror in an arc, turning it to bear precisely on that area of space through which the passenger spokes of the wheel turned; but the motion of the mirror was infinitesimally slow.

As the crew of Hot Rod strove to get it into position to fire; and the computer on the wheel strove to precess the wheel to a position where firing would be fatal to the firer, it became a race between giant snails.

But already the rim of the big wheel had inched slightly ahead in the race; and the main part of the hub was disappearing behind it. In spite of Elbertson's orders, the big wheel continued to turn its rim directly towards the giant balloon with its bulbous nose.

It was a curious sensation, seeing the big wheel from this angle. Much the same sensation as that of an ant, staring at the oncoming wheel of a huge truck.

In the machine shop, Mike was rummaging around in one of the tool lockers. "Any sort of a small telescope," he muttered, almost to himself. Then "Paul, is there a theodolite or anything like that left lying around in here?"

"Yes," said Paul, moving off to a cabinet in another part of the room. "We needed them when we were putting the wheel together."

"O.K." Mike turned back to the laser milling machine. "Now can we take the focusing lens off of this, and rig something to give me a focus at about 4.5 miles? Or would it need focusing at all? Shooting at that distance?"

"Depends on what you shoot, Mike. The unfocused beam can make a black surface very hot very quick. But from a mirror surface, it would just bounce, unless it's carefully focused."

"It ought to take care of the plastic at least, then."

"Go right through it. You gonna laser Hot Rod?"

"No. Just the anchor tubes that hold the mirror; and maybe a slash through the nitrogen tank at the back. Here, make me a bracket to fit these two things together, so I can see what I'm aiming at." He handed the theodolite telescope and the laser milling-head to Paul.

"How much of the machine do I have to take to power that milling-head?" he asked Tombu.

"Oh, most of it's just control circuits. This box on the back is the power supply. Plugs right in to ship's power."

"Hey!" Mike called over to Paul now busy constructing a bracket. "Make that bracket to hold this power supply, too. Oh, and round me up about sixty feet of extension cord, Tombu."

"But, Mike, how are you going to get out there?" Millie's voice was concerned. "They've probably got men all over the place out here on the rim. If you try to go through the corridor towards an emergency lock, they'll have you sure with their needle guns. You heard Elbertson delegate three men to kill you!"

"I expect I can find a place where they aren't." And picking up the Security radio from the intercom bench, he turned it on and spoke into it.

"Elbertson, this is Mike Blackhawk. You now have twenty minutes to surrender," and he cut off.

Mike turned to Tombu. "Get me some plastic wrapping material. Preferably a plastic bag. I've got to make this stuff waterproof."

When the power supply, telescope, milling head and extension cord were rigged and carefully wrapped in plastic to make a waterproof package, he attached them with a shoulder rope.

"Too bad we didn't make a lock in the wall right here," he muttered. "But I don't suppose the Security guards will be guarding those empty labs over in the R-12 sector. Guess I'm going for a swim now." And with that, Mike reached down and carefully removed the inspection plate from one of the floor tanks, and lowered himself over the edge into the racing waters.

Hanging there with one hand, he carefully pulled his plastic bag into position beside and slightly behind his body, and let go. Instantly he was sucked away into the subdued blue fluorescent-lighted glow of the waters of the rim.

"Glad they figured these planktons need light," he thought to himself. "I'd have a time finding where I'm going in the dark."

Forty-five seconds later, he reached up and snatched at a passing hand-hold, next to a plate marked with the numbers of the lab he sought.

Wrenching the handle of the inspection plate and pushing it free, he climbed out into the deserted lab; made his way out into the corridor, his unwieldy package hanging to his shoulder and runlets of water making a trail behind him—and stepped into the nearby emergency lock.

In the lock he quickly donned one of the emergency spacesuits that hung there, gathered up his bundle again, and stepped out on the catwalk of the inner part of the rim, under the brilliant night sky at the moment, but turning towards its "sunrise." He opened his plastic package.

"Major Elbertson," he said, turning on the Security radio, "you now have five minutes to surrender."

Attaching his suit to the guideline nearby, part of the rim's "hairnet," he crept out over the inside edge of the rim. From this position he had a full view of the glowing bubble that was Hot Rod for the few seconds until the movement of the rim took him past the "sunrise" point and turned him sunwards.

Last time Mike had been out on the rim, the wheel had not been turning. There'd been no reference of up and down, other than the rim itself as an oddly curved floor. Now he felt disoriented. The wheel was spinning, the hub, therefore, seemed "up." And from the edge of the rim where he clung to its hairnet, all directions were down.

The stars seemed to sweep beneath his feet and over his head; and though it was a slow pattern, only twice as fast as the crawl of a second hand around the face of a clock, it was, nevertheless, disorienting.

Bracing himself carefully into the net, with his back wedged firmly against the rim, he adjusted his bizarre "gun" to rest on his knees so that he could sight in the direction that was, to his body's senses, straight down.

Not at all, he thought, like trying to shoot fish in a barrel. More like being the fish and trying to shoot the people outside the barrel.

Back in the shadow again. Not really shadow where he sat, but the rim around him, below him, and curving away from him, had disappeared in its brief nightside, and there came Hot Rod again. Carefully he tracked it; then putting his eye to the scope he focused briefly on one of the high-pressure supporting tubes that formed the rigid structure from which the aiming mirror was held in place.

And fired.

The tube burst, noiselessly but quite spectacularly. And the mirror itself shuddered, shook, as the tube's gases escaped.

Now he was in bright sunlight again, quickly closing his eyes as the sun itself looked full into his vision, and slowly passed to be followed by Earth, to be followed by a blank stretch of starry space, and here again was Hot Rod.

Carefully he tracked another of the supporting tubes.

And fired.

And again a spectacular, writhing collapse—and this time, the mirror fell free, supported by only two tubes, and permanently out of focus, incapable of aiming the monster beam.

This time, Hot Rod was definitely secure from the misapplication of Security.

"Three minutes," he spoke into the radio. "Your weapon is dead. My next shot will be through the nitrogen tank at your air lock. I wouldn't advise you to be there."

The wheel turned once more, as the radio came alive from the other end.

"Mr. Blackhawk, do you realize that what you are doing constitutes mutiny in space and will be dealt with accordingly on Earth? I have officially taken control of Hot Rod at the command of my superiors in the new U.N. Security Control Command."

Mike didn't bother to answer. As the wheel turned him towards Hot Rod again, he said into the radio, "Two minutes."

Elbertson's voice came again. "With this new weapon we control Earth. Don't you realize that you can't stand up against the new people's government of Earth?"

The wheel came around. Mike replied: "One minute."

The lock on the Hot Rod control room opened. Frantic tiny figures burst forth, activated scuttlebugs, and started on the five-mile trek back towards the big wheel.

Mike worked his way back through the clinging net to the catwalk, failing completely to see the tiny figure that dodged beneath the rim as he approached.

Glancing around, he carefully scanned over the entire inner rim before stepping out into the sunlight of the catwalk itself. Nothing.

Then a blink caught his eye, and he glanced up toward the observatory. There. In the observatory.

He thought for a minute it was someone signaling, but it was only a touch of sunlight on the shiny surface of the automatic tracking telescope, which was poked out of the open shutters of the airless observatory, still doing its automatic job of recording solar phenomena in the absence of the astronomers.

Instead of re-entering the lock as he had intended, Mike linked his safety line to one of the service lines that lay along the nearest spoke, and kicked up it.

On Earth, he could have jumped maybe four feet with that motion. But here, it carried him the full distance to the outer wall of the hub-shielding tank, where he grasped another line, quickly transferred his safety line, and began working his way toward the observatory.

As the intersection of the rim where Mike had been passed into darkness, another figure moved and jumped up the same line he had taken. But this Mike did not notice.

Reaching the bulge at the end of the shielding tank and crawling up over it, Mike made his way up, at an odd reversed angle, through the netting; and into the observatory dome through its open shutter.

Making his way about in the open vacuum in free-fall conditions of the observatory, Mike carefully checked the lock at the main axis to make sure that he could get into it without arousing an alarm for any guards that might be nearby.

The lock showed vacant, and empty. Just as he was about to enter it, he saw another figure in a spacesuit come drifting through the open shutter where he had entered.

Mike stepped into the lock, closed the door behind him as though he had not noticed, and cycled the lock. But he did not remove his suit and did not leave.

As the lock showed clear, the observatory door opened again, and the two spacesuited figures stood face to face. Mike with needle gun raised checked himself in surprise. Then he motioned the other figure into the lock.

"And just what are you doing here?" he inquired as the air around them became sufficient to carry his voice.

"You might have needed help," answered Dr. Millie Williams in a small, scared voice as she took off her helmet and shook out her long hair.

"And just *what,*" Mike inquired, "were you planning to do about it besides having me shoot you by mistake?"

Millie held up an oversize pair of calipers. "The Security people," she said, "are not the only ones with weapons. I borrowed this from the machine shop."

Mike stared down at the odd-looking "weapon."

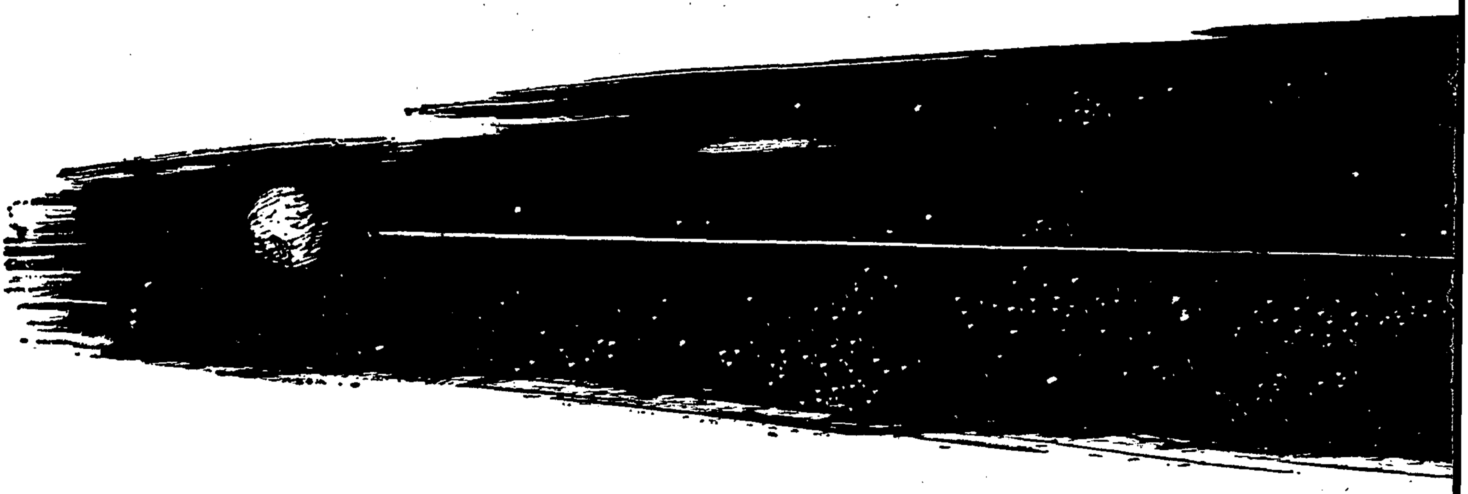
"It's hard," Millie continued, "to look at more than one thing at a time through a space-suit helmet. I could've got 'em in the air hose while you held their attention."

Mike's chuckle was just a trifle ragged, and his mutter about blood-thirsty panthers didn't really go unheard as he began shucking his spacesuit.

This was the most dangerous point, Mike knew. The axis tube went from the observatory straight through to the south polar lock, with nothing to block sight or sound from traveling its length. They'd have to simply chance it. Their spacesuits shucked, he opened the lock.

Their luck held. No Security man was stationed opposite the mouth of the axis tube at the south polar lock.

Halfway to the engineering quarters, Mike stopped, used a special key to open an inspection plate, and they dropped lightly into the huge shielding tank that now held only air. From there the pair back-tracked Mike's



original path to the inspection plate in the engineering quarters, and so into his own bailiwick, where they found Ishie standing on catlike guard, a wrench in one hand, waiting for whatever might come up.

"Confusion say," the grinning Chinese physicist declared, "two for one is good luck."

General Steve Elbertson made his way wearily in through the south lock and on to the bridge where he found the communications officer in complete charge with two Security men for assistants. The captain and Bessie were effectively bound, and placed in spare console seats.

General Elbertson made his way to the captain's console and seated himself.

Hot Rod was dead, but their control was by no means lessened.

That he himself had not been shot dead on the way from Hot Rod was, to him, a confirmation of the weakness of his enemies.

The satellite was under his control. The scientists would repair Hot Rod—and well he knew how to see to it that they did so.

U.N. Security Forces were in complete, dictatorial command of Earth.

He had only to eliminate the renegade Indian, and long before the Security scuttlebug, now on its way from Earth loaded with crack troops, should arrive, Security would be in complete command not only of the Space Lab, but of the weapon, which would by then be in repair.

As a final test of its operation, it would be amusing to use the Indian, Blackhawk, as a target; and perhaps the captain as well, though he might have to use them as examples sooner—the captain and some others.

The fortuitous accident that had put Hot Rod in operation ahead of schedule had also stepped many plans months ahead. No violence had actually been planned until the weapon had been thoroughly tested; but now things looked to be working in orderly fashion; working with the well-oiled precision of a master-plan, properly designed and properly executed in the proper military manner.

Only one small difficulty marred the current smoothness of the operation. The Security men were attempting to instruct the computer to precess the wheel back to its original position.

In reply, for every figure of any type sent over the keyboard, the Cow sent back a half-yard of confused, rambling figures and would do nothing else.

General Elbertson snapped a single command. "Turn the thing off. We'll get to that later."

Busily the men switched keys to the "off" position. Just as busily the Cow continued to pour out figures, interspersed with rambling pages of physics covering such odd subjects as the yak population of the Andes, the number of buffalo that were purported to be able to dance on the rim of the Grand Canyon—a fantastic figure—some confused statement about the birth rate in Indo-China, and an equally confused statement about the learning rate in schools in Haddock.

Eventually, if one cared to sort it out, the Cow might produce the entire Encyclopedia Britannica for the year 1911; and then again, possibly for the year 33,310. Actually, it only depended on what you wished to select. It was a vast mass of material that was being happily upchucked into the lap of the confused communications officer and his two, unhelpful assistants.

Not a single one of the view panels, either those at the computer's console or the ones at the captain's console, were presenting a readable picture. Hodgepodges and

flickerings, yes. Scraps of star-lit sky — perhaps. Or vaguely wavy electronic patterns that would have been familiar to anyone who ever looked at a broken TV set.

The Cow was really wild.

Leaning back in the captain's chair, watching the screen casually, General Elbertson chuckled.

He didn't, he noticed, feel nearly so weary.

The position actually was good, even if those idiots didn't know what they were doing with the computer. That could be straightened out.

Somewhere, he was sure, there was cause for great pride in his actions.

The peaceful glow of victory seemed to settle about him.

He HAD won. He was in the captain's chair of the only space station that man had ever put in orbit.

His worst enemy was tied to a chair only a few feet away.

At times like this a man could glow, could feel expansive even towards his enemies.

Naylor wasn't such a bad chap. If he hadn't thrown in with the scientists he might even now be a fellow officer, entitled to full respect and honor.

General Elbertson did not consider it odd that his face was suddenly flushed with triumph. There was a glow of energy. Why, he could even get up and dance a jig — and this he proceeded to do.

Around him, the two Security men joined in, followed by the communications officer — and then, realizing that their friends couldn't dance with them, they undid the ropes and invited the captain and Bessie to join them.

Soon they were all whirling giddily, though there was hardly the space for it. Maybe they should go next door, into the large clear area that was the ship's gymnasium when not being used as a morgue.

Surprisingly, amidst these dancing figures, a head emerged from the floor. All of them leaned over to laugh at it; and even the needle gun failed to frighten them.

Bessie had a hangover. She groaned and stretched. There certainly must have been lots of vodka at that party last night.

Party? What party?

It was difficult to separate various concepts and orient herself to a present where and when.

Slowly the soft susurrus background song of the big wheel penetrated consciousness, and another, closer roar. Millie taking a shower, she realized.

Suddenly she came out of the vagueness wide awake, the hangover cleared magically, evaporating much too quickly to have been caused by alcohol.

But she had been tied up to a chair on the bridge beside Nails, prisoner of the Security men, only minutes ago.

WHAT was going on?

Millie stepped out of the shower into the compartment the two girls occupied, and smiled.

"How're you doing? About to come out of it?"

"Da. Da eta—" with an effort Bessie switched to English. "Explosion? What happened?"

"Oh, Mike just had to get the Security men off guard. Something to do with the air supply. He asked me to apologize to you if you don't feel so good. But after all, we got the Lab back, and that's the main thing."

"Security. Oh! I've got to get to Nails right away. They've taken over Earth, too, you know. We've got to make sure they don't get control of the projects. We'll be shot, of course. But their ambitions rest on having control of Hot Rod and the wheel. Probably secret control—"

"But—"

"Nails has got to figure out how to destroy the project without too many casualties. Maybe he can get some of our men back to Earth, though of course we're all expendable. We can't let these monsters have the wheel and Hot Rod! That's what they need for power—"

"Bessie—"

"Of course, we can stand and fight for as long as possible, but we're sitting ducks, and even with Hot Rod there's not much we can do—we can't fire on Earth, we'd hit friend as well as enemy. So I think we've just got to stand and fight a bit, and then destroy both Hot Rod and the wheel. Anyhow, that's Nails' decision, and I've got to get to Nails—"

"Whoa!" Millie finally managed to stem the flow. "We're not stuck—not just stuck here in orbit any longer, waiting to see what's going on on Earth," she said softly, "or what they're going to do about us 'mad scientists.' Mike and Ishie started this whole thing when one of their experiments turned out to be a space drive, and the boys are working real hard on getting a drive unit set up capable of taking our whole complex out into space. But they need somebody to tell the captain . . . uh . . . properly . . . as soon as he's awake that is . . . uh . . . you know what I mean."

"Whoa, yourself, girl. What's this—space drive?

"Well, they didn't find out themselves until after it had wiped out Thule Base—nearly ten hours after that, in fact. That magneto-ionic thing the Sacred Cow's been talking about—they invented that real quick to cover up. You see . . . oh, it's too complicated.

"Look, we've got a real *space* drive. We can go to the moon or Mars—or Pluto if we want to. And we've got to let Nails know real quick that he *can* get us out of here—and without making him mad that we wrecked Thule Base. But really, after the way those Security goons acted, maybe he won't be mad if you handle it right. How about it?"

The hangover was disappearing magically. But this flow of information was nearly as bad.

A space drive? Bessie knew she couldn't evaluate one way or the other on that. That would be Nails' problem.

But they were in a pickle, and it would be up to her to see that Nails didn't waste too much time evaluating things. Those Security men had been prepared to play real rough, and more of them were on their way up.

"Where is Nails?"

"The boys put him to bed. In his quarters. He got a dose of the same stuff that put you out. He ought to be coming to almost any time now. And probably mad about the whole thing."

Instantly, Bessie was on her feet, flinging on clothes, and out down the corridor toward Nails' private stateroom.

It had been thirty-two hours since Major—General—whatever it was Elbertson—had been defeated on the bridge for the final time.

He and his men were now securely locked in one of the empty labs. The paralysis effect of the needle gun had probably worn off. Mike hadn't checked to find out.

Bessie and her relief operators were watching the prisoners through a video display on the Sacred Cow's console, and would report anything unusual that went on to Captain Andersen.

Mike, Ishie, Millie, Paul and Tombu had completed the new Confusor drive units, and they were nearly installed.

More time would be taken arranging the engineering quarters so that the installation of her control panel and the units themselves would be completed.

This part, Mike didn't like too well. It meant re-arranging his already carefully arranged units, and considerable re-wiring without interfering with any of the basic functions of the wheel.

The new units had turned out to look very little like the original. Fourteen feet long by eighteen inches outside diameter, they looked very much like a group of stovepipes arranged in a circular pattern around the engineering quarters, braced from wall to wall.

The control console itself, even though made rapidly, had the look of a carefully planned and well-made unit; something that might have turned up in one of Earth's better R&D labs, as part of a multi-million dollar project.

All together, the drive rods would provide something better than a tenth of a gee thrust for the combined mass of the wheel, Hot Rod, the pile and the other subsidiary units around them.

A tenth of a gee. Not enough to land on Earth; but with things down there the way they were now, who wanted to?

With these units, the whole storehouse of the solar system was at their disposal.

With these units they could reach the asteroids.

With these units, they could range as far out as Pluto without fear of consequences—without, Mike added to himself, even the fear of radiation that was a constant threat to them here, for the farther from the sun they went, the less radiation they would have to endure. The three months would be extended. For those who needed it, better shielding could be found.

The system was theirs.

Possibly, also the stars beyond.

That, he reminded himself, if they could get these units installed before the scuttlebug arrived.

Undoubtedly, Earth Security had sent arms as well as men.

Where they were, not strictly on course, but still in a satellite-type orbit, they remained sitting ducks for any number of countermeasures that Earth might throw against them.

Once gone from this orbit, there was not sufficient rocket-power on Earth to track them down.

If they took Hot Rod with them, there was no single weapon at man's command that could stop them. And take Hot Rod with them they would.

In his address to the ship's personnel this morning, Captain Nails had made it quite clear that they wanted no part of the plots and counterplots of Earth; that theirs was the job of scientists, not soldiers; that a path was open to them that they would follow.

Later, they could return. Later, with the supplies that were free to be taken from space, they could build strength.

They could return quietly, one by one, two by two, at times and places of their own choosing.

Then, and only then, they could lend aid to those on Earth who would always fight for freedom.

But not now.

They were yet weak; the path of escape and the path of promise lay before them.

The only help they could be would be to follow that path.

It might not be that the path led where they wanted to go – or where they thought they were going – but nevertheless the path was there, and follow it they must.

Quite a speech, Mike thought. There had been much more, but that, and the Declaration of the Freedom of Space, were the parts that had stayed with him.

That last they had broadcast back to Earth, thrown, as it were, into the screaming teeth of the new dictatorial leaders.

Mike leaned back from what he was doing and caught Ishie's eye.

He chuckled, and said "That was quite a mass of stuff that the Cow upchucked on your command. Why didn't you just freeze her like I thought you were going to do?"

"Confusion say," quoth Ishie blandly, "he who would play poker with dishonest men should never put all cards on table too soon. Or in other words, Confusion is the better part of valor. The garbage made them think that the Cow had sprung a cog somewhere, without ever guessing that we had control.

"And by the way, Mike, that was quite a trick you pulled with the air supply. Having the Cow boost up the oxygen on the bridge until those idiots got so drunk they were climbing the walls."

"You don't happen to have any education as a psychologist, do you Ishie? Or perhaps a brain surgeon?" Mike inquired. "It seems a shame to drag those Security apes along with us. We can't just dump them overboard, but it would be nice if we could just confuse them or something."

"Sorry, Mike. Techniques of brainwashing are a bit out of my line. Besides, Confusion say those who run from wolf pack have better chance if they leave some meat behind for the wolves to fight over. I've already spoken to Captain Nails about it. We *intend to* dump them overboard—just twenty minutes before the scuttlebug arrives. In suits, of course," he added. "Then we'll take off and see whether Security takes care of its own."

There was a possibility, Mike felt grimly, that perhaps Security wouldn't take care of its own. But then, he asked himself, did he really care? And found it very difficult to come up with an answer. But he realized with vast respect that the master of Confusion was not himself confused as to the issues involved before them.

"It's lucky for us," Mike said, "that you happened to pick this time to be aboard. Your work would have gone more smoothly if you'd waited until the next go-round."

Ishie grinned, for once slightly embarrassed. "Confusion say," he said, "luck is for those who make it. I expected that with Hot Rod coming into operation, some such play would be attempted. I've met Security before."

Millie laid down her soldering iron, and disappeared through the bulkhead, returning shortly with a tray of sandwiches and coffee.

Coffee in real cups, for there was spin on the satellite, things were working well, and those bottles—ugh.

"Relax, boys, we've still got three hours," she told them. "Radar hasn't spotted the scuttlebug yet. But our new communications officer, Lal, has them on the line. He's apparently convinced them of his honorable intentions and gotten an exact prediction of arrival time. They think Major . . . uh, General Elbertson has the situation well in hand. They even think Hot Rod's operational!"

The crew relaxed around the circular room, squatting wherever convenient, and sipping luxuriously at the cups of coffee, munching sandwiches, and for the moment content.

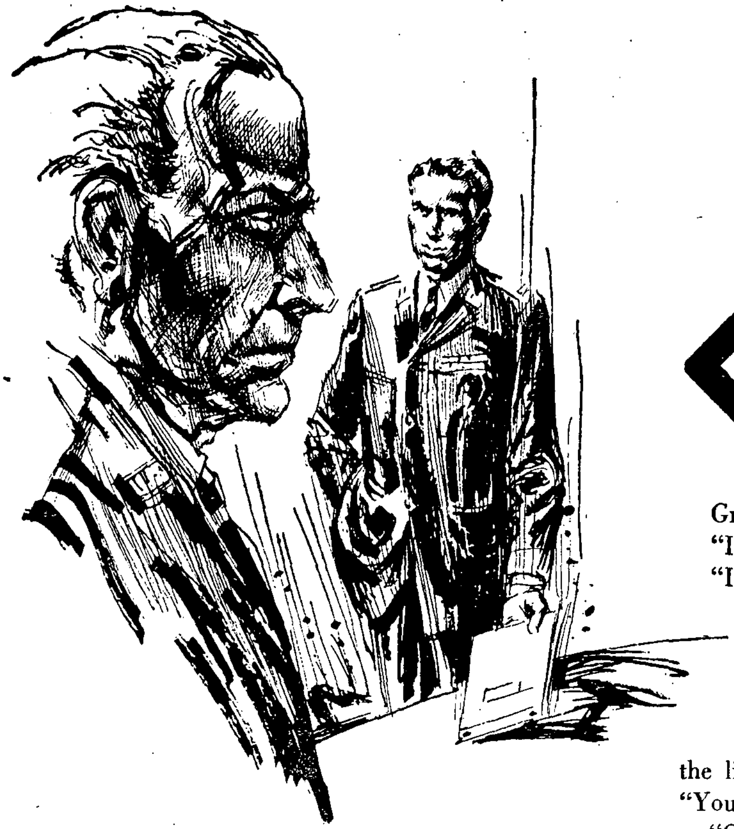
Hot Rod had been secured to the ship with extra acceleration cables, and as soon as practicable a remote-controlled Confusor would be placed aboard to assist in any fast maneuvers that they might have to make: but for now there was no acceleration, and the group composed of the wheel, the big laser, the dump and the pile moved peacefully in orbit under free-fall conditions.

Millie began to hum a soft tune. Someone else brought forth a harmonica that had been smuggled aboard, and suddenly Paul Chernov burst into song, his deep baritone, perhaps inspired by the captain's speech earlier in the day, lending the wailing "The Spaceman's Lament," an extra folk beat:

"The captain spoke of stars and bars
"Of far-off places like maybe Mars
"But the slipsticks slip on this ship of ours—
"And we'll get where I wasn't going!"

Mike looked over at Millie as she drank her coffee, a slender, dark figure—able with a soldering iron; able as a defending panther; able as a spaceman's mate. He was glad the captain of a ship was a proper marrying officer, for he had an idea the feeling he felt was mutual, as he joined with the crew in the chorus:

"There's a sky-trail leading from here to there
"And another yonder showing—
"But when we get to the end of the run
"It'll be where I wasn't going . . ."



Colonel Martin Grainger read the top-secret document through slowly in the privacy of his office, shook his head gloomily, slapped the papers down on his desk, and walked over to look out the window. All he saw of the outside was a blurred image of sky, ground, and building. The blurring, he was vaguely conscious, came from an unworthy weakness; the tear ducts in his eyes were preparing for that release from unbearable stress granted to women and small children. The tightness in his throat came from the same source. As this knowledge touched the edge of his mind, he stiffened, dismissed the idea before it had a chance to become fully conscious, and grimly faced the fact that now not even a lifetime's work would ever be crowned with the only reward that meant anything to him.

There was a friendly rap at the door. It was the rap of an ally, in a competition where allies were necessities, whether Grainger liked it or not.

"Come in," he called, and he was relieved that his voice was clear and unemotional, as always.

The door opened, and a trim man of about sixty, the two stars of a major general on his jacket, stepped into the room, nodded and smiled.

Two hours ago, Grainger could have smiled back naturally. Now he forced a smile.

"Good afternoon, sir."

The older man smiled at him.

"Think you can handle it, Mart?"

Grainger kept his face blank.

"I'll do my best, sir"

"I know you will." He sat on the edge of Grainger's desk. "Don't be ill at ease, Mart. I wouldn't have picked just anyone to do this job." He rapped out a cigarette, automatically started to offer the pack to Grainger, laughed and said, "I forgot; you don't use them." He snapped the lighter, paused and looked at Grainger quizzically. "You don't object?"

"Of course not, sir."

"Don't be so formal, Mart. I'm Al, remember?"

"Yes . . . Al."

'That's better." He blew out a cloud of smoke. "What do you think of the plan?"

Grainger reminded himself that he desperately needed this man's friendship.

"It's a very logical plan . . . Al."

"I'm glad you say so." He stood up, still friendly and apparently unconscious of the gap of rank between them. "You'll be charged with the actual execution of Phase I. I've already talked the plan over with Lyell Berenger, and he's agreed that the best moment for the attack is the 30th, at 0300—Moscow time. Our preparations should be complete by then. If we wait, there is no assurance we'll retain the advantage. It could be the atomic monopoly, all over again."

"Yes, sir."

The general stubbed his cigarette out in the clean, unused ashtray on Grainger's desk. He crossed the room and, scowling, studied Grainger, who came to attention. When the general spoke, his voice was sharp, with an undertone of sympathetic concern.

"What is this, Mart? You're capable of this job. I picked you, remember? Out of the herd. There were brighter ones, and there sure were smoother ones. But I'm not a fool, Mart, and I never would have picked you if I didn't know you could do the job. You've got the stuff. That's elementary. You also have a quality that is none too com-

PROBLEM OF COMMAND

The problem of the subordinate who feels the boss' plan is wrong
everyone can understand. But the problem of the commander
in that type of situation isn't so obvious...

CHRISTOPHER ANVIL

Illustrated by Leo Summers

mon these days, if it ever was common. You aren't easily swept along, and you don't bribe. I know that. Therefore, I can trust you. Don't panic on me." He paused a moment, then laughed. "I know what you're going through, Mart. I know how I felt with my first independent command. But I would never have given you this responsibility if I hadn't had complete faith in both you *and* the plan. You're going up there in a few minutes to see Lyell Berenger. What of it? He has three stars, sure." He studied Grainger's face. "Mart, what I'm trying to tell you is, you're at a ceiling, and you've got to get through it. *You* are three-star material. But you'll never get the first one, you'll fall farther and farther behind your class, you'll be passed over for promotion, you'll retire with the same rank you have now— *if* you go into that office *scared*. This is too important to entrust to a man who lacks confidence. Mart, what *is* it?"

Grainger drew a deep breath.

"Sir, the plan is wrong."

The general stepped back. He started to speak, changed his mind. He looked Grainger flatly in the eyes.

"If you tell that to Berenger, I'll see you retired on corporal's pay."

"If you can do it, that's your privilege." Grainger's voice carried an unintended rasp of hard defiance.

The general stared at Grainger, and for a moment his eyes seemed to mist over. He turned away. "I'll never trust another human being."

"Al." Grainger, who never relied on emotion, acted before he could stop himself. He caught the general's arm. "I'm not attacking you. But that plan won't work."

"That plan is my baby. You attack that plan and you attack me."

"I never saw it before yesterday. I'd have told you—"

"Who do you think you are? I didn't submit that plan for your approval. You were to familiarize yourself with it, and prepare to carry it out."

On Grainger's desk, the phone rang imperatively.

The general scooped it up. His entire bearing and personality changed instantly. His voice conveyed friendliness and respect, with a warmth that it seemed impossible to counterfeit.

"Sure, Lyell," he said, with a laugh at some question Grainger couldn't hear. "A little buck fever, maybe. He'll be right up."

He hung up, and looked at Grainger. "No one gets to my position without the capacity to forget. You can still have that first star, Mart."

Grainger nodded, but couldn't bring himself to speak. He picked up the plan from the desktop, slid it into a flat tan case, turned, and feeling the general's gaze in the center of his back, left the room.

Lieutenant general Lyell Berenger was a strongly-built man, engaged, when Grainger came in, in an argument with his daughter. The relationship was obvious at first glance in the girl's jaw, nose, regularity of features, and bearing. She was handsome rather than pretty, and though she was attractive, she was also formidable.

"Yes," she was saying exasperatedly, "but as far is I'm concerned, he's got as much backbone as a bowl of mush. I'll grant you, he's got brains, tact, education, tact, upbringing, tact, culture, tact, a good build, tact, and everything else a man needs except a backbone. He's never said anything but just the right thing since I've met him. I can't bear him."

"But, Babs," said Berenger, "somebody's got to give."

"How did he get *you* to start in on me? I'll bet he was very *tactful*."

"Not at all; I just wondered."

"I'll bet."

"You can't stay single forever, Babs. If your mother were alive, she'd tell you—"

"Now just how do you know what Mother would tell me? Are you going to try to convince me you can think like a woman?"

Berenger changed color. "No, but the trouble with *you* is, you think like a man!"

"What's that got to do with it? That's neither here nor there. You said if mother were alive she'd tell me—"

"She *would*."

"And *I* want to know," said the girl remorselessly, "how do *you* know what she'd tell me? *Can* you think like a woman? You just admitted you can't. Therefore you can't possibly know what Mother would tell me!"

Father and daughter glared at each other.

"Get out of here," said Berenger. "A man can stand only so much in one day."

"I stepped in because you asked me to," said the girl, unintimidated.

"Well," said Berenger, "that was my mistake." He spotted Grainger, who had been listening in fascination to the argument. "Just what are you doing in here, colonel?"

"Sir, I thought you wanted me to come straight up. The outer office was empty and this door open. I was preoccupied, and I'm afraid I stepped in without thinking."

"You could have had the decency to step out again."

Grainger briefly shut his eyes. Downstairs, "Al" was at this moment calculating where to sink the knife in, and now, before the plan itself was even brought into the conversation, he had succeeded in offending the one man whose opinion of it was vital. For just a moment, he felt the anguish of a lost dream.

For the better part of his life, Grainger had wanted that one star more than he had wanted anything else. Women, liquor, and dice didn't tempt him. He had never married, and he wasn't interested in anything but soldiering. That had gotten him through O.C.S. and lifted him from one rank to another not too far behind competitors who had gone to the Point. But the closer he came to the center of power, the slower it lifted him, and now he could see that he would never make that first star. The silver eagle would be the zenith of his career, and he didn't think he would remain at the zenith long. And if he couldn't have the star, the hell with it. He might just as well get it over with.

"Colonel," Berenger was saying evenly, "I'd appreciate an apology."

"Sir," said Grainger, "I've come straight from a fight with one general, and I might as well have a fight with another."

The girl, just opening the door to go out, turned around again.

Berenger blinked, "Al didn't say anything."

"I don't disagree with him, sir. I do disagree with the plan."

"It's his plan."

"I don't think it's going to work."

"Have you discussed this matter—"

"Sir, I just finished discussing it with him. That's what the argument was about."

Berenger glanced at his daughter, his face expressionless.

"Get out of here, young lady. And I mean right now." This time, she went out.

Berenger picked up the phone, changed his mind, and put it down again. He looked at Grainger.

"Do you realize what you're doing?"

"I realize that this plan calls for a surprise attack on the Soviet Union, using a completely new scientific device. The aim is to hamstring Russian nuclear-delivery capability, immobilize Russian armor in Eastern Europe, and by progressive stages sabotage all Russian heavy industry, transport, light, power, and means of communication. That is Phase I."

"And you don't think it will work?"

"No, sir."

"Why not?"

"For two reasons, sir. First, it's an attack without a real reconnaissance. Second, it's an attack without a defense."

"You don't claim to know more about this device than the scientists, I hope."

"I don't claim to understand the *modus operandi* of the device at all. *How* it works is beyond me. But a man doesn't have to understand how an internal-combustion engine works to be able to use it. I know what this device is supposed to do, and on that basis I know that this plan is dangerous."

"Are you sure you really *do* understand it?" said Berenger. "How long have you had to study it?"

"Yesterday and today. It takes a certain length of time to cut through the technical phraseology. It's only in the last two hours or so that I've been able to see it clearly enough to realize what's wrong."

Berenger frowned. "This has a peculiar sound, colonel. Men with far greater experience and technical knowledge have concluded that the plan was sound."

"It wasn't up to them to actually carry it out. The parts look right but the whole is no good."

"All right," said Berenger. "If there's something wrong with this plan, now is the time to find it out." He frowned a moment at Grainger, who was still standing, and glanced around. "Pull up a chair, colonel. The one by the door is comfortable."

"Thank you, sir." Grainger turned to get it, and the door, which was open a crack, moved slightly, as if in a slight breeze. Grainger picked up the chair, set it down, and saw Berenger studying the door. As Grainger sat down, Berenger stood up, looking past Grainger, and said, "Perhaps if you'll move the chair a little to your right, there'll be less glare."

Grainger did as he was told, but there was no glare worth mentioning in either place. The only sunlight was slanting in to one side of both of them, and Grainger's back was turned slightly toward it.

Berenger opened up a drawer of his desk, leaned back as if to rest his feet on it, changed his mind, and swung his chair in the other direction.

"Suppose," said Berenger, "that you start with a brief description of the device itself."

"It's known as a 'displacement device.' It consists of three parts: circuit 1, circuit 2, and the sending coil. When an object is placed in the focus of the sending coil, and a current is passed through the two circuits simultaneously, the object in the sending coil will be 'displaced.' That is, it will be transported through something called 'Zeta space,' and will reappear in normal space in a different location. At the same moment, if the light in the new location is intense enough, the light will overcome what is called 'barrier potential,' be displaced in the reverse direction, and appear as a flicker in the sending coil. This flicker can be resolved to give a visible image of the new location. The device causes a slight structural rearrangement in the objects sent, but this is only harmful in the case of the higher animals, which suffer nervous damage, and die quickly."

Berenger nodded approval. "Now, tell me, what if there is a physical object already in the space to which another object is sent by the displacement device?"

"Liquids or gases are moved aside, just as a stone thrown through the air or into a pool will move liquids or gases out of its way. But if a solid already occupies part of the space, only so much of the object in the coil will be sent as will emerge in space not already occupied by a solid object. It seems to me there must be borderline cases, but I don't know enough to say anything about that."

Berenger nodded, frowning. "Now just give a brief resumé of the plan itself."

"The plan is very simple. It involves sabotage on a massive scale. For the purpose, there are batteries of SFD units; that means, 'Spotter-Flasher-Displacement' units. Now, again, I haven't been given the technical details. All I know is that a 'spotter' unit is one that uses the flicker in the coil to detect an object and 'lock onto' it. The 'flasher' provides the extra light needed to overcome the so-called barrier potential, so that the spotter unit can work. Meanwhile, the 'displacer' unit is programmed to displace a metal slug that will block a fuel line, or a quantity of special glue that will bond moving parts together, or whatever else seems suitable to cause the greatest disablement in the shortest possible time. Each one of the SFD combinations can be programmed to handle a particular type of target.

"Now," Grainger went on, "the first step is sabotage of Russian missiles. Closely following that is sabotage of the Russian bomber force. Next, the immobilization of their Eastern European armored forces—such of the Russian armor, that is, as might try a strike against Western Europe. Next follows sabotage against Russian industry, transport, light, power, and communications. That is Phase I."

"Don't you think it will work?"

"Sir, I was laid up in a hospital one time, and all I had for entertainment was a book that made a comparison between war and chess. It told how you should go about winning a game of chess *strategically*. I think I remember enough to give you an idea. First, you isolate one wing of your opponent's forces. Second, you bring the bulk of your power to bear against the isolated wing, maintaining only enough power on the other flank to hold off the enemy. Third, you crush the opponent's isolated forces with your superior concentration of power. Fourth, you wheel your mobile forces into the conquered battleground, and strike your diminished enemy with overwhelming force from the flank. Fifth, you grind up any remaining pockets of resistance piecemeal."

Berenger grinned. "What's wrong with that?"

"Not a thing. But what's the *other* side doing all this time?"

"And your objection to this present plan?"

"The same thing. This plan assumes they're as helpless as a cow in a slaughterhouse. All it tells us is how to slice up the corpse. It's all very logical, so far as it goes. The fine details are excellent. But what if the corpse fights back? The basic assumption throughout is that we now have a monopoly of the displacement device. But how do we *know?* We could find out by using the SFD units in a reconnaissance sweep just before the attack."

"Haven't you read the reasons for not doing that, in the plan itself?"

"Yes, sir. To maintain secrecy until the last moment. 'Premature use of the device would reveal our intent.' It certainly would create a sensation. But all that would be visible would be the dazzling burst from the flasher units—so many beams of brilliant light displaced through Zeta space to provide illumination for the spotter units. Certainly, if it were done long before the preparations were complete, it would serve as a warning. But the point is that it *wouldn't* be done before preparations were completed. It would, therefore, serve only as a shock and a surprise, *unless they have the device themselves*. In which case, sir, we'd be a lot better off if we found it out."

Berenger said, "You mentioned another objection?"

Grainger frowned for a moment. Why, he asked himself, was the general so apparently unconcerned? If what had been said so far was true, the plan was badly at fault. Grainger knew it. Certainly Berenger, with his far greater experience, must also see it.

"Go on, colonel," Berenger prompted.

"Yes, sir. The first objection is that we are striking without a proper reconnaissance, when there is no real reason why we shouldn't make such a reconnaissance. The second objection is worse yet. We're striking without having a real defense. Sir, under Paragraph 17, of the second section of these plans, there is mention of the 'necessity for exerting maximum force in the early stages of the attack.' The argument is that by doing so, we will knock out the enemy missile and bomber forces, and thus be safe from counterattack. But, again, this assumes that the enemy has no developed defenses using the new device. How do we know this? We can't know it unless we carry out a reconnaissance."

"You've been all over this," said Berenger.

"Yes, sir, but not from this particular viewpoint: What happens if the enemy has a few dozen nuclear bombs or warheads ready to throw at us, *from each of the several displacement installations we haven't located because we didn't look?* Then what? This device removes an object from ordinary space, displaces it through Zeta space, and returns it to ordinary space at a location depending on the setting of variable circuit elements in circuits 1 and 2, the amount of energy available, and so on. And when this object reappears, it is already in the target area. It doesn't follow a trajectory so that you can try to hit it on the way down. It's already there. There's nothing to prevent it from going off instantaneously on arrival. The trajectory has been through Zeta space, and it's clear from the plan that there is no way to follow it through that."

"I think," said Berenger, "that you made some mention of Paragraph 17, in the second section?"

"Yes, sir. This paragraph is in explanation of the need for absorbing our own nuclear strike force displacers into the SFD units at the height of the attack. Sir, this is precisely when we'd need them."

"You're speaking of the displacement devices we now have assigned to our nuclear-delivery units."

"Yes, sir. If we convert these displacers for use with SFD units, merely for sabotage purposes, what do we do in the event of an enemy threat to counterattack using his own hidden displacement devices? What do we do *in the event of an actual enemy attack?*"

"As you said yourself, colonel, there's no defense against that. What can we do in case of an attack anyway?"

Grainger stared at the general dizzily. He hadn't heard of this device till yesterday, and he hadn't unwound the complexities of it till a couple of hours ago, and now he had to *explain* it.

"Sir," he said patiently, "I admit, if they attack with everything at once, I don't see *what* we can do. But there are two objections to converting the nuclear displacers to SFD units. In the first place, they might . . . the Russians, I mean . . . might deliver a limited nuclear blow in reprisal for our sabotage. If we then responded with a limited nuclear attack in an unimportant region, they would see we were prepared to strike back, and we both might be able to work our way out of the mess. But if we can't strike back except by more sabotage—if our only choice is to either go on as we had been going, or else quit—they could work us into a corner in no time. They might even decide to end the trouble permanently. That's one of the things that's wrong with breaking up our own nuclear displacement units in order to strengthen the attack."

"What's the other?"

"They might know we'd done it without *having* to test us by a nuclear blow. They'd know by spying on our displacement units, using their devices."

"I can assure you," said Berenger, "we've had no word of any such use of their devices—if they have them. You remember, they can only use the device for spying purposes with an auxiliary light source. We keep the light in our displacement installations well below the intensity needed to enable them to spy. And we would immediately detect any auxiliary light source."

"Sir, this is an age of automation and miniaturization. I don't claim to have the technical knowledge to know whether small electronic devices would suffer from the same rearrangement of structure that damages the nervous system of a living creature when it's displaced. It seems to me that a proportion of such devices would be undamaged and usable. In that case, spy devices could be placed in our displacement installations *without* any flash of light. They could be put in more or less blindly, disguised as other things—lab tools, cigarette butts, whatever seemed most suitable, and in whatever place seemed best from study of the architecture of the outside of the building. The spy devices would then provide the information needed, perhaps by relaying it through other units outside."

Berenger nodded slowly. "Do you have any further objections to your superior's plans, Colonel Grainger?"

Grainger winced. "I have others, sir, but I think these are sufficient."

Berenger reached for the phone, then paused. "What would *you* do, if you were making the plan?"

"Multiply our SFD units further, do everything possible to find out if the Russians do or do not have the device, plant disguised spy devices wherever there appears to be such an installation, and do everything possible to find a defense against the displacement device. The present plan looks good when you read it off, Paragraph 1, Paragraph 2, Paragraph 3. But, sir, the nature of the device described is such that the plan won't stand up to analysis."

"And yet, you claim no great specialized knowledge of displacement devices?"

"Sir, I don't need specialized knowledge of cars to know that if I push on the accelerator the thing will go faster. I don't know the first thing about the chemical reactions that take place in a muscle, but that doesn't keep me from using it."

Berenger nodded. "All right, colonel. I've listened to you. Now, if you wish to retract your statement, and if you will agree to go along with the plan as stated, I won't call your superior officer and describe the gist of this conversation to him. If you refuse, I will have to do it." He reached for the phone.

Grainger stared, "I'll resign my commission before I'll go along with this plan."

Berenger picked up the phone.

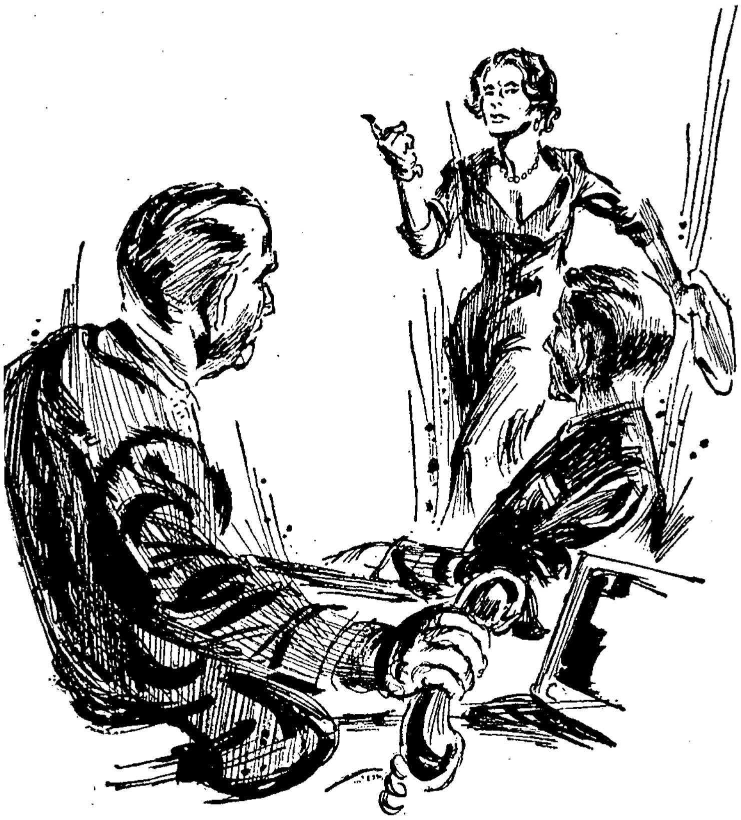
The outer door opened up, and the general's daughter stepped in. Her eyes were slightly widened as she looked at her father.

Berenger pressed down the bar in the phone's cradle, and said, "Just where were you?"

"In a chair right outside the door of this office. I heard the whole thing." Her eyes flashed. "You can't order *me.* If you go through with this, I'll see that it reaches every newspaper in the country."

Berenger glanced from his daughter to Grainger.

Grainger was looking at the girl in admiration. As she glared at her father, her fine, regular features, and the slight flush of emotion, gave her beauty. And there was no questioning the fact that she had a good figure. True, that look of iron will-power—or self-will, whichever it was—was enough to scare off almost any man. On the other hand, she was a challenge, far different from any of the girls Grainger had known. And there was no questioning the fact that she had a mind—albeit a highly independent one.



"Hm-m-m," thought Grainger, studying her.

A flicker of hope passed across Berenger's face, then vanished as he spoke into the phone.

"Hello, Al? Your protegé is up here, and he's just torn your plan to shreds. Moreover, he refuses to go along with any part of it." Berenger smiled. "Quite a stab in the back, isn't it? . . . Yes . . . Yes . . . No, nothing personal, he just doesn't like the plan, that's all . . . I'd come up if I were you. Sure, we can arrange it . . . Yes, come up and help me plan the court-martial. Maybe we can nail him for direct disobedience to orders, insubordination and"—he glanced at his daughter—"divulging confidential information to unauthorized persons . . . All right, Al." Berenger put the phone in its cradle.

His daughter was watching him in puzzlement. She started to speak, then changed her mind.

Grainger was watching the interesting play of emotions across her face.

Berenger said, "Out, Babs."

She didn't move, but stood watching him in puzzlement, her mind obviously sorting things over.

Berenger glanced at Grainger. "Colonel Grainger, would you remove this intruder before she wrecks the routine completely? Watch out for her. She knows judo."

Grainger got up. "That's all right. I know judo, savate, karate, aikido, yawara, ate-waza, and Shanghai Municipal Police close-combat."

She blinked at him, and suddenly smiled. She had a nice smile, "I'll go peacefully."

"Get her out of here," said Berenger. "Make sure she doesn't stay in the outer office. Put her on the elevator."

"Yes, sir."

Grainger walked her out into the hall.

She said, "Do you know what he's up to?"

"I don't have any idea. I'm completely lost. But I never heard of two generals getting together and arranging a court-martial *that* way, so I'm not going to give up yet."

"He's not angry with you at all. He's pleased with you. And there's something else, but I can't put my finger on just what he's trying to do." She glanced back. "I wish I had some way to know what happens. He'll delight in teasing me and not telling me a thing."

Grainger made a quick decision. A few minutes later, he was back in Berenger's office, with the two generals studying him quizzically. Assuming he got through this, he reminded himself, he had a date with Berenger's daughter.

"Sir," he said to his superior, "I'm sorry. But that displacement device just doesn't fit in with those plans."

He expected a rebuke, but got a smile instead. "It doesn't actually fit in with *any* war plans—*yet.*"

"I don't understand, sir."

"We have such a device—with a few points of difference. And the Russians have it, too. Use of it creates a detectable disturbance, like the tremor and shock wave created by nuclear devices. The result is, *we* know they have it. And *they* know we have it."

Grainger frowned. "Sir, what are the points of difference?"

"Range is one. The curvature of normal space is too gradual to allow use of the device on the planet, or even in the way we'd like to use it, within the solar system. Whatever we send ends up *too far out.* In addition, there's a theoretically explainable, very slight random effect, negligible when considered over the enormous range of the device, but nevertheless measured in a great many Earth diameters. Incidentally, we estimate this error by the highly expensive process of boosting out an entire prepackaged displacement installation, complete with self-contained power supply, and preset to send back a series of objects whose radiations we then struggle to detect. The scatter is impressive. If we tried to hit Moscow with this thing, we could kick up a fuss in the asteroid belt, and consider ourselves lucky, at that. About all the device is really good for right now is getting rid of radioactive waste. It's fine, for that purpose. And we're trying to develop it into a tool for space travel. But for warfare on Earth, it's as worthless as a 21-inch gun in close combat."

Grainger thought it over. "And the plan?"

"What we've just been speaking of is a device that operates outside of normal space. This present device doesn't happen to use the theoretical Zeta space mentioned in the plan. But how do we know the Zeta space mentioned in the plan doesn't actually exist? Or if not that, something equally capable of serving the purpose? A great many devices predicted long ago, and ridiculed for a generation or more, have now come into existence. We have atomic devices, rocketships, and heat rays. We begin to become wary. What's coming next? To be capable of higher command, a man seems to need the capacity of a sea captain. While the technological deck heaves and lunges under his feet, he has to stay upright."

Grainger nodded.

Berenger said, "Do you realize what it involves to try to keep up with this new technology? Despite the best technical training available, it's impossible for even the specialists in a given field to keep up with *their own field.* And *all these* fields can affect war. Do you see what that means? Until we have some means of multiplying the present rate of learning so that it can begin to keep up with the advances of technology, we have to expect new advances to be flung at us from time to time that we can't possibly understand as a scientist understands them. In the First World War, there were commanders who never did figure out the meaning of a machine gun. In the Second, we had teams of technicians and scientists going out to explain the devices. That's important. But now we have reached the point where it becomes glaringly obvious that one of the most important requirements of higher command is *the ability to cut through technicalities, and quickly sense the possibilities of even the most fantastic new technological devices.* And this will very likely have to be done *under stress.*"

Grainger blinked. "So the plan was a *test?*"

Berenger nodded. "We put you under the tightest stress we could manage, let you think you'd be ruining your career if you gave an honest answer, let you have a scene with your commanding officer, and after you'd won, we offered you a hole to crawl back into; but you came through anyway. We've had others fail."

Grainger felt himself pale as he realized how close a squeak this had been. All he would have had to do to disqualify himself was to think only of getting a promotion.

Berenger noted his expression, and grinned. He reached in a drawer and took out a pair of silver stars.

"Here, put these in your pocket. Al will want to pin them on, but I can give them to you. It may take a little while, but don't get impatient.

"The papers can come through fast when we find the right man *these* days." ■

THE ANALYTICAL LABORATORY

PLACE	STORY	AUTHOR	POINTS
	JULY 1963		
1.	The Ethical Engineer (Pt. 1)	*Harry Harrison*	1.62
2.	New Folks' Home	*Clifford D. Simak*	2.37
3.	A Knyght Ther Was	*Robert F. Young*	2.45
4.	New Apples in the Garden	*Kiris Neville*	3.50
	AUGUST 1963		
1.	The Ethical Engineer (Conc.)	*Harry Harrison*	1.64
2.	The Hate Disease	*Murray Leinster*	1.81
3.	"To Invade New York . . ."	*Irwin Lewis*	3.47
4.	Patriot	*Frank A. Javor*	3.57
5.	Controlled Experiment	*Arthur Porges*	4.41

THE EDITOR.

SEAGOING "SPACE" SHIPS

Continued from page 16

personnel. This network consists of three types of intercom stations, each varying in channel capacity, which link the technicians. Any station on the intercom network may also be tied into the radio communication circuits, and there's also a complete public address system for group announcements.

The timing subsystem of these ships is of vital importance to the successful evaluation of mission data, of course. Space age operations are defined in terms of thousandths—and even millionths—of a second, so that the ships must depend heavily on the precision time subsystem for correlating events during a tracking exercise.

In order to carry out this precision responsibility, the shipboard timing is synchronized to one hundredths of a second of Cape Canaveral time and is maintained with a stability of five parts in ten billion per day. The timing system receives the high frequency signals transmitted by the U. S. National Bureau of Standards' station WWV and low-frequency station NBA. Both the high- and low-frequency timing signals are received on a single whip antenna which uses a diplexing filter to separate the two frequencies.

Weather, too, plays a vital role in the missions and the tracking ships are equipped as floating meteorological stations. These gather detailed surface, upper air and upper atmospheric data. Weather instruments, weather balloons and rocket-sondes are used to gather information as to surface wind direction and velocity, temperature, humidity, air pressure and density, winds aloft and the speed of sound. A ten-foot weather balloon—wiresonde —is using to gather data up to a few thousand feet. These balloons are tethered to the ship by cable and they are instrumented so that they send back data through the cable to recording instruments in the meteorology room. Other balloons are simply released from the ship and tracked to determine wind direction and velocity, temperature and humidity.

Data as to the upper atmosphere is gathered from weather rockets that are fired from a miniature launching pad in the stern. A special electronic system for controlling the time of firing these rockets contains sensing equipment that signals when the ship is perfectly level. The information gathered is fed through the ship's central commuter to correct radar and telemetry data and also sent via teleprinter network to Cape Canaveral. There the data is computed for altitude versus pressure, density, wind direction and speed, refractive index, dew point, temperature, relative humidity and speed of sound.

The complex navigation system of these ships continuously supplies information on the ship's position, heading, velocity and vertical reference. This system consists of a ship's inertial navigation system, a navigation control console, a water speed-measuring system (E-M log), a star tracker, a teletypewriter, an Mk-19 gyro-compass and sonar bench mark equipment. The navigation system contains three gyros and two accelerometers. Because of gyro drift, this inertial system develops errors that increase with time. This precision or draft error is determined by a star fix, as the star tracker measures the star altitude by "locking" on the star's position. A computer solves the celestial problems and a navigation fix is made. The sonar bench marks are also used to update the system's accuracy. A bench mark is dropped over the side in a known position, with an acoustic transponder mounted on a buoyant tank which is anchored by a battery container. When the sonar set is triggered, a reply is received from the transponder. The elapsed time, as a function of range, is measured to each beacon, thus locating the ship with relation to the bench marks.

Just a short time ago, ships such as these would have been considered impossible, even if some fertile brain had thought of them. No one then could imagine instrumentation on such a gigantic scale, packed into such a relatively small package as an ocean-going ship. Nor could they imagine, even if such a ship could be built, that the unpredictable motions of the ship could be measured with such accuracy and corrections made with such speed. ■

UFO

continued from page 7

planes. The observation rules will be that we can't go anywhere near any airport, and that the conditions usually associated with "flying saucer" observations are applied. I.e., the photographer is not prepared, the observation is accidental, sudden, unexpected, upsetting, and exciting. Those emotional conditions are about the worst possible conditions for getting good photographs, of course.

Now these mysterious flying crosses are reported to have very peculiar characteristics. Sometimes they are heard long before they are seen. Various observers claim they make deep, enormously loud thundering, pounding noises, with a heavy beat like an immense slow drumming. Others say they make a weird howling sound that's a cross between an unearthly scream, and a shriek all mixed in with a dull thundering noise. Still other reports hold that one of the most bewildering characteristics is that they're sometimes observed, quite by accident, immensely remote in the sky, and only *after* they have passed is any sound heard!

Obviously the observers reporting that are simply mistaken, because if the sound is heard only after the object passes, this would mean that the machine was traveling faster, or nearly as fast, as sound itself! Traveling faster than sound is obviously ridiculous; calculations made on the air resistance encountered by something traveling near the speed of sound clearly show that it would require 100,000 horsepower to move any vehicle large enough for a man to ride through the air at such speed. This is more power than the greatest power plant in the world produces! And it is suggested that something with that much power would not be too heavy to fly!

(As of 1893, some such calculations could have been made—and that 100,000 horsepower figure represents allowing them to make a good calculation. Modern jets normally do require something on the order of 35,000 horsepower; not knowing the finer details of streamlining, the 1893 scientists would be certain 100,000 was an absolute minimum. And that any such fantastic power output could be obtained from something as small and light as a modern fan-jet engine would be impossible of imagination in the then-available technology.)

The observations of the flying crosses, moreover, are very unsatisfactory in many ways; some observers report seeing monstrous things half a mile long and with the crossed member almost a third of a mile long. It was reported to be very clearly seen by six or eight people, at a distance of about ten miles, flying just above a hill that allowed them to determine its enormous size.

The speed of the machine was reported to be at least 800 miles an hour.

(So . . . ? So, if you didn't know anything about planes, and saw a modern 707B climbing after take-off, how would you be able to guess its size-distance-speed? Given *any one* of the three, the other two could be deduced; when all three are unknowns, you're trying to solve an equation in three unknowns, with only two equations to work with. So the plane was in fact much nearer than the hill—but there was absolutely no way for the observers to determine this.)

(We will spare the "flying cross" observers the problem of some of the delta-wing hypersonic fighters, and not subject them to a sonic boom. They'll have troubles enough trying to describe something no one ever saw before anyway, without making the problem tougher. We won't even make them try to describe a helicopter to some Senior Authority in mutton-chop whiskers and gold watch chain.)

There will, of course, by the nature of things be three general classes of reports: hoaxes, misobservations, and accurate observations. The hoaxes will fall into two classes; those perpetrated purely for self-satisfaction of some type, and those that might be called lies-for-greater-creditability.

There's the story of the early Irish immigrant writing home to Ireland back about 1847, and telling his home-folks that over here in America he got meat to eat three times a week. An American friend saw the letter, and said, "But why do you say that? You know darned well you're eating meat three times a day!"

"Oh, they won't really believe I have meat three times a week, and they'd know I was a liar if I said three times a day!"

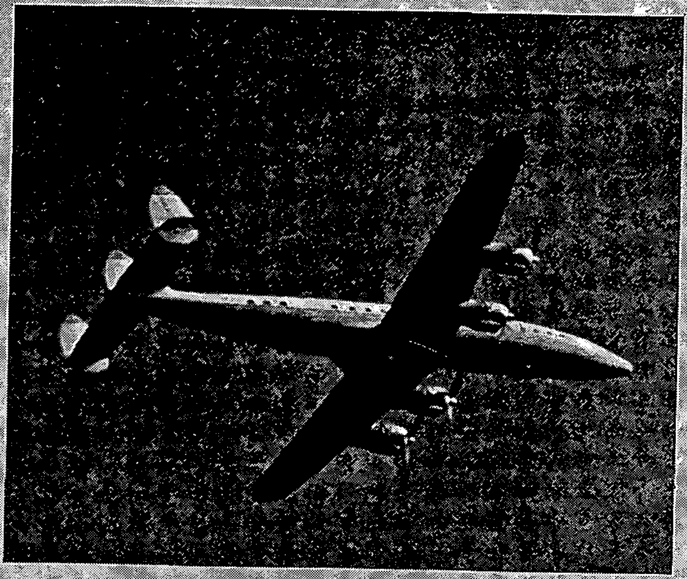
Sometimes people don't tell the truth because they have a better chance of getting a seventh of the truth believed.

Now in the matter of photographs, there will be a similar problem. Some will be hoaxed for the sake of hoaxing; some will be efforts to do, by table-top and model photography, what can't be done verbally—convey what the strange thing looked like. And when these photographs are detected as hoaxes—that, of course, proves all "flying cross" photographs are really just clever hoaxes.

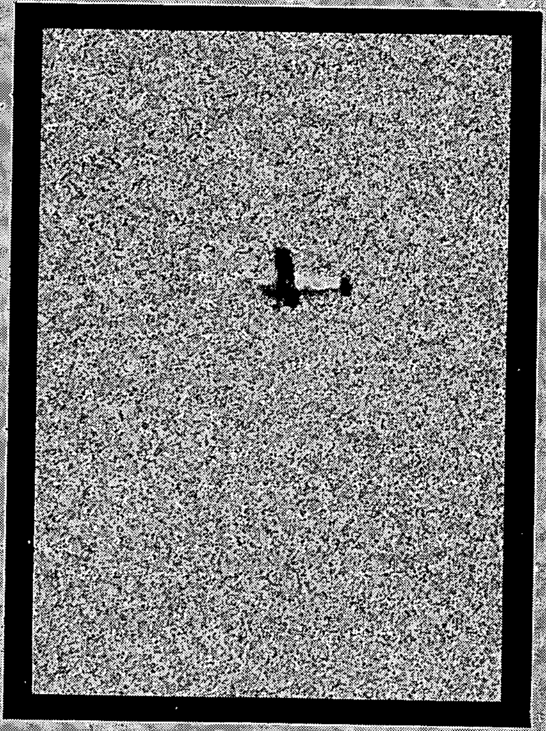
So let's take a look at a portfolio of "flying cross" photographs that do seem to show some strange sort of something . . . but "through a glass darkly" because of photographic, technical, and human-emotional difficulties.

We'll leave out all the pictures of an airplane flying out of the right ear of a handsome young man in prison-uniform-striped bathing suit, and bristling mustache, or the belle of some gay '90's picnic, with a DC8 emerging from her bosom, accomppanied by explanatory statements about how the strange drumming sound was heard, and the writer hastily grabbed the camera, and excitedly shot a picture of the flying cross as it passed low overhead . . . only forgetting to turn the film, and so getting a double exposure. ". . . But luckily, the flying cross shows quite clearly on the photograph anyway . . ."

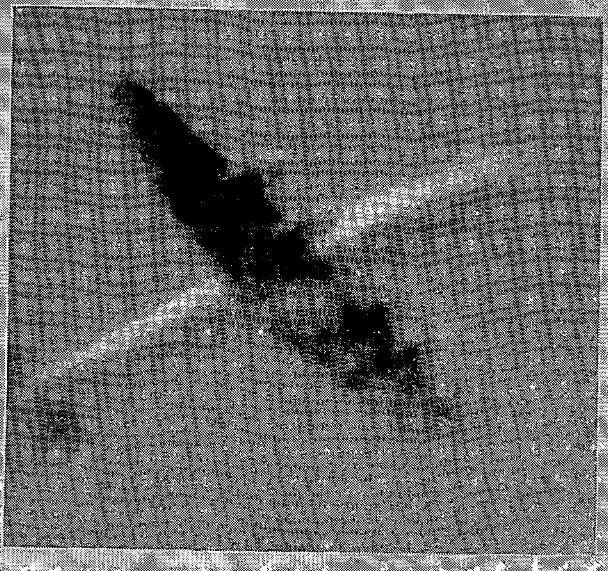
The possibilities of frustration in photographing the flying crosses are immense; the probability of success remote!



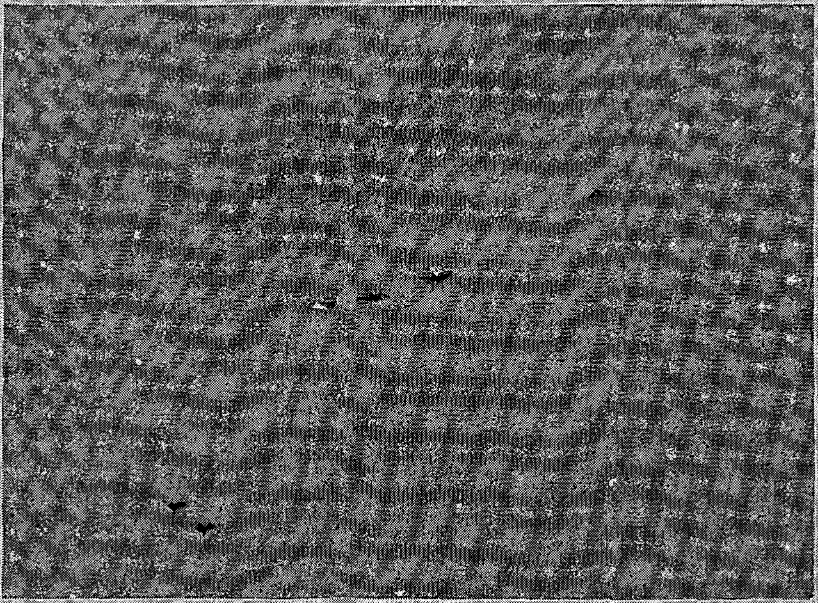
1
To get things straight; this is a 15-diameter enlargement from a 35mm negative made on Tri-X Pan, using a red filter to darken the sky, shooting at 1/1000th second, with the Nikkor Reflex 500mm long-telephoto lens. This lens is actually a catadioptic telescope of the Matsukuov type; because it's a folded optical system, it's very short for its focal length, and can be hand-held for following moving subjects. That is approximately the equipment required to get a clear picture of an airplane in flight.



2
"I heard this strange drumming sound, and saw the flying cross before it passed overhead. I happened to have my camera with me, so I immediately got it, focused, advanced the film, leaned against a tree to make sure I didn't jiggle the camera, and got this picture. The man at the drugstore said that this big an enlargement wasn't very good, but the image is so small on the film . . ." [Actual: 1/1000th sec, Tri X Pan, standard 58mm Fl. 4 lens, 30 diameters enlargement.]

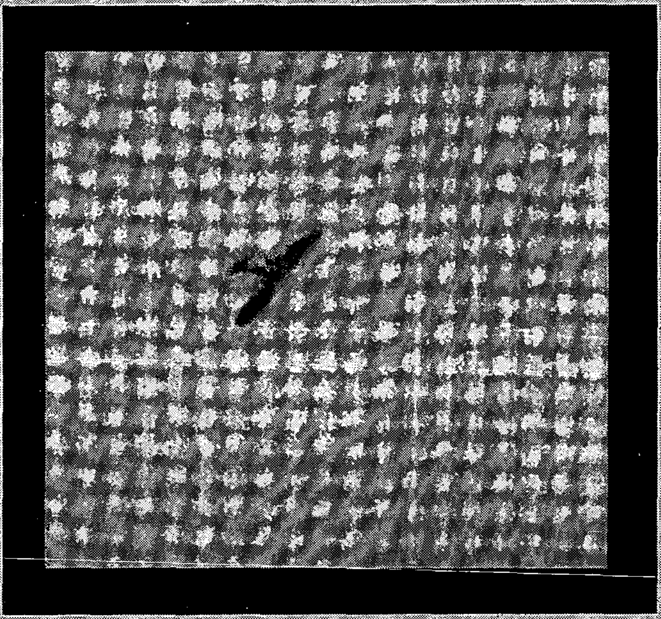


3
"We were on a picnic at the beach, when we heard this weird drumming thunder, and my daughter was the first to spot this flying cross coming over a hill. It was an immense thing—as big as a great ocean liner, and the pounding noise it made in the air was frightening. I picked up my camera, and took this picture of it, and one more, before it got out of sight. Unfortunately, in my excitement, I forgot to focus the camera . . ."



4

"We all heard this strange drumming sound in the air, and we had heard of the flying crosses of course, so we looked around. There were a lot of trees, and it was some time before I spotted this whole group of flying crosses. I'd picked up my camera as soon as I heard the sound, but they were pretty far away, and I guess I overexposed, too, so the enlargement isn't very clear . . ." [Birds, of course! This represents the misobservation problem; the plane passed below his line of sight and never was visible.]

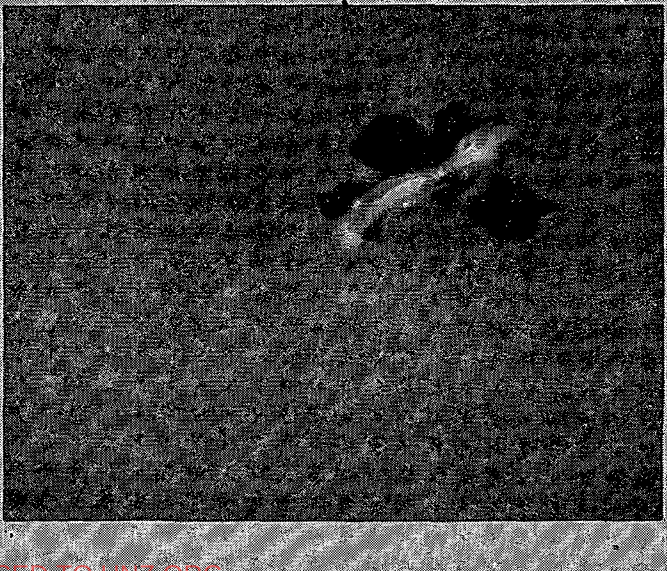


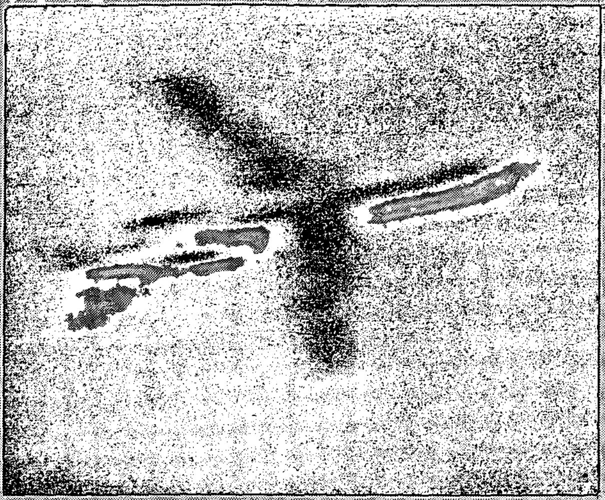
5

". . . But when I got the print back from the drugstore, there's something wrong with it, because the thing didn't really look like this. My friend says it was a bird, but I know it wasn't . . ." [Paper was moved under the enlarger during printing. Same effect as moving the camera while taking the picture.]

6

"My Papa was in swimming, so I used the camera; but he says girls don't do things right." [*No, it's not a biplane—it's upside down, out of focus, and jiggled though.*]



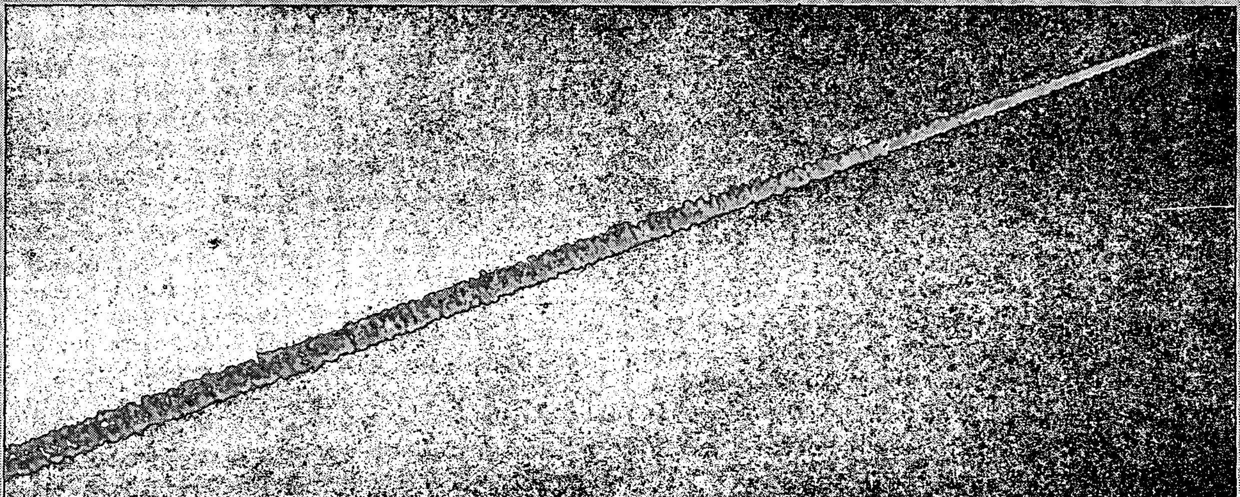


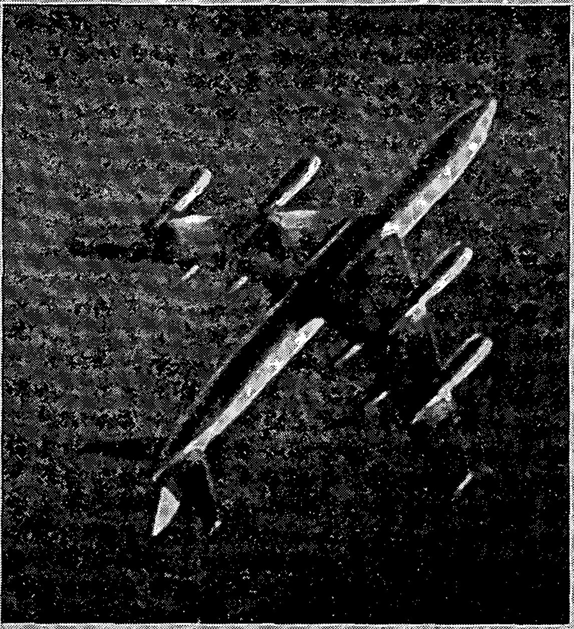
7

"I'm sorry I had only that cheap camera. It was a weird thing, traveling at terrific speed, with an eerie screaming roar. It was not a bird; it was all shining silvery metal of some kind. The exposure was 'instantaneous,' but not fast enough for this flying cross thing." [Anybody want to try to identify what it was before it was photographically loused up?]

8

"I'm an amateur meteorologist, and I'd been out taking pictures of cloud formations, using a red filter to darken the sky, when I noticed this very strange cloud forming. It developed in a perfectly transparent deep blue sky without any other clouds in its area, and grew with incredibly speed across the sky in a perfectly straight line—an extremely unnatural phenomenon. I've never seen or heard of anything like it. It was a single, sharp line of cloud that seemed violently turbulent. In the photograph it is broken up into swirling masses. I took the picture because of the strange cloud—and only after the cloud had extended beyond a line of trees did I hear the strange sound. It is quite indescribable, but I knew then what 'flying cross' observers meant by the 'weird rumbling scream.' However, even though I was using a 20-inch lens on the camera, and enlarged the plate as much as possible, there isn't a sign of any flying cross on the negative!" [Actual: At 15 diameters, there isn't a trace of the jet that was making this contrail. But it would drive a Nineteen Century meteorologist nuts!]





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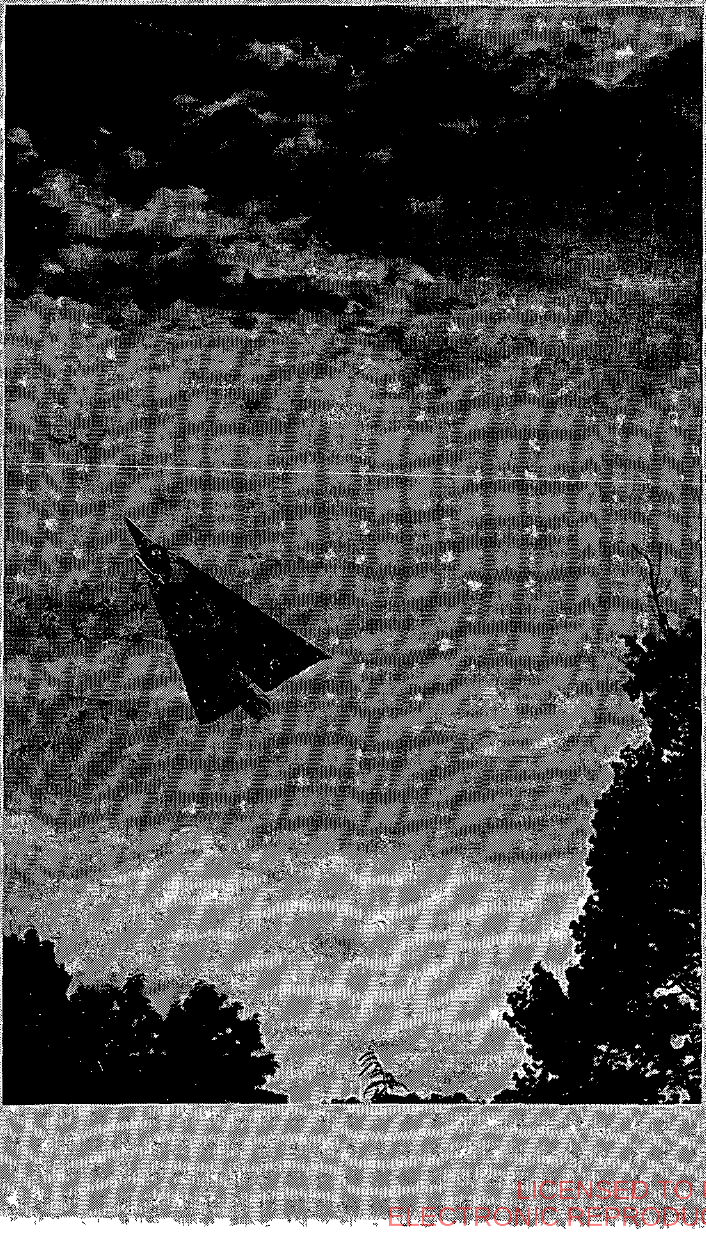
"I was out trying to photograph birds, with my specially built camera using an extreme telephoto lens, when this wonderful machine darted right in front of my lens. The camera was on a tripod, and it was sheer luck the machine went in front of it. It made a tremendous hissing roaring screaming noise, and there was some kind of rays shooting out from the strange machinery that held it up and made it go. I call them 'the antigravity engines', but I'm not sure. The rays streaming out from the machinery were rather faint, and hardly show on the negative, but they were blue-white and shining. The thing was immense, at least a quarter of a mile long. There were portholes, but they were so small in this enormous ship of the air that they can't be seen. The eight huge engines are mounted on the cross-beams to support the ship, but the rays they shoot out must be dangerous, so they're mounted out on the beams so they won't endanger the thousands of passengers the huge thing must carry." [So what good would it do the 1890s scientists if they did have a perfectly sharp, clear picture? They wouldn't know which end was up! They could maybe figure out the intricate technology of jet engines from a photograph of a plane in flight?]



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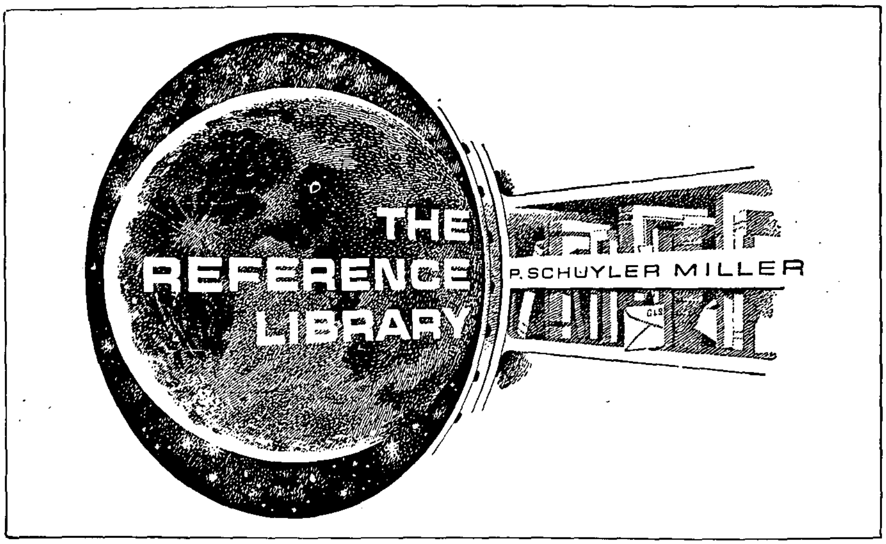
"I was returning home from a day in the woods with my camera, toward the end of October, when I heard a weird sound that was partly a scream, or shriek, like a cat being stepped on, partly a heavy rumbling noise, and partly a strange kind of hooting noise. I thought immediately of the things I'd heard about 'flying crosses', and looked up. The sun had just set, and the full moon was rising; against the lighted sky, I saw this flying cross in my photograph. In a moment, before I had time to change the film and get another shot, it was gone." [So he heard a train going over a trestle blowing its whistle, but *what* is that thing he caught in his picture . . . ?]



TERRAFORMING

One of the most fascinating concepts developed in science fiction has been that of "terraforming" another planet to make it suitable for human life. It is not beyond the realm of probability that NASA or the Rand Corporation may have projects in force to determine what must be done to provide Mars with its lost atmosphere and water and reverse the appalling greenhouse effect of Venus.

Actually, for ten thousand years or so, we *have* been terraforming a planet —the Earth. It has been done by trial, error and willfulness, and although in some regions—Europe, for one—the result has been to increase the land's carrying power for human societies, in others productive land has been converted to desert. If present trends continue, Earth will become more like Mars than Mars like Earth.

This process is described as well as I have ever seen it in "The Last Horizon," by Raymond F. Dasmann, published by the Macmillan Company for $6.95. Now Associate Professor of Wildlife Management at Humboldt State College in California, Dasmann is that rare bird, a practicing ecologist. When he writes about Africa or the Arctic, he has been there to see the complex living communities of plants and animals, soil and water, climate and weather that have evolved there.

An ecologist, you might say, is a *gestalt* biologist—almost that vanished creature of the eighteenth and nineteenth centuries, the natural philosopher. He is a kind of one-man committee who has politely refused to accept the dogma that a scientist must be a specialist. If ecology becomes respectable—as it must, if we are to keep on living comfortably with what we have on Earth—there is a real danger that men like Professor Dansmann will be replaced by committees, or by "teams" co-ordinated by a computer.

Early Man was a rather rare animal who adapted his habits to the part of the world where he was trying to find food and shelter. Even after he had learned to make tools—and it now seems that he was a tool-maker before he was a "man"—hundreds of thousands of years passed before he did much to change his environment. Anthropologists have recently developed the idea of "primary forest efficiency" to explain why forest peoples —the Indians of eastern North America and the Amazon jungle, the tribes of the Congo and of parts of southeast Asia—appear to have resisted civilization: they had adapted so efficiently to living off the forest, by fishing, hunting, gathering plant foods and growing some of them in small gardens, that real agriculture and large-village living simply offered them no real advantages. The transition might even have meant a lower standard of living for a time, as the forest was cleared, the game driven off, and an expanding population required to live on less and less natural food. The Eskimo—as the article in the August Analog pointed out—had fitted themselves into the Arctic ecology in a similar way.

Once urban man began to change his environment, he often started an irreversible process. "The Last Horizon" spells this process out very clearly for the principal ecological divisions of the world. When abandoned New England farms grow up to brush and weeds, they do not return to the climax forest that the pioneers found there. When wheatfields of the plains states are allowed to stand idle, the prairie does not return. When overgrazed rangelands in the high plains are given a rest, the grass does not come back. North Africa, of its own accord, will not become the rich granary of the Roman Empire—nor will the forests from which timber was shipped to ancient Egypt and Babylon recover the barren mountains of Syria and Palestine. In thousands or tens of thousands of years, perhaps—but these ravaged lands are in poorer condition now than when their original vegetational successions began.

Modern Egypt, for example, has discarded the traditional "gift of the Nile." Fertile silt from the highlands of central Africa and Ethiopia is still brought down by the annual floods, but it no longer spreads over the river bottoms and renews their fertility. It is stopped by the dams on the upper Nile, built to bring the advantages of modern irrigation to the desert at the expense of rejecting the natural renewal that for thousands of years made Egypt great.

Fire, naturally started and set by man, has played a more important part in maintaining certain grassland ecologies than most people realize. Without fire, the great white pine forests would never have existed. Without fire, parts of California might have become the chaparral desert that they are now turning into.

There is no need, at this late date, to go over the arguments against the uncontrolled use of herbicides and pesticides in Rachel Carson's best-selling "Silent Spring." By bluster and counterattack the chemical industry has tried to scare Miss Carson away, rather in the mood of beating a tin pan to scare migrating birds away from a grain field. Yet the same issue of the daily New York *Times* that reviewed "Silent Spring" carried a story about an association of New Jersey farmers that was looking for some way to destroy the hundreds of thousands of birds that migrate south across their fields. And today's paper tells how the use of Lake Erie as a sewage disposal basin is destroying the lake's fishing industry by using up the dissolved oxygen and smothering the micro-flora and -fauna on which fish feed.

The point which "The Last Horizon" makes over and over again is that ecologists have to reckon not only with human biology but with human society. What if the most effective way of supporting a human population on the African plains is by harvesting the herds of antelope and other large game animals that are adjusted to the ecology? The symbol of wealth and status is cattle, and cattle are what a man must have—in Africa as in Texas. And who cares if wholesale spraying to destroy black fly larvae gives the Adirondacks a "silent spring" with no birds in the trees and no trout in the streams? The birds wake people up in the morning, and we can get the state to stock full grown trout after the spraying is over and the streams have flushed clean. Hatchery trout are easier to catch, anyway—they're used to being fed, so they bite on anything. The guests always get the limit, and they come back next year. So who *wants* birds and wild trout?

Numerous stories have envisioned a future in which mankind is fed entirely from hydroponic gardens or with synthetic proteins and carbohydrates, "scientifically" compounded. If we keep on with our present terraforming techniques, that prediction may be by no means farfetched. The Amazon jungles can probably be turned into croplands only by cutting down the trees and building sheds full of algae tanks, or getting "Chicken Little" started—and deserts will be less costly to clear. Or an extraterrestrial race may come along that likes planets without people. Maybe they'll vegaform the Earth.

* * * * *

Over and over again, readers of this department demand: "How can I buy it?" There is no easy answer, but there are some common-sense rules to follow.

The publishers of hard-bound books will usually sell you a copy by mail, although they may charge an extra quarter handling charge. It is purely impractical to repeat the full address of every publisher with every book, but I do give the city, and "Doubleday & Co., Garden City, N.Y." will probably be enough unless you have a very hard-nosed postmaster in your town. But if you have a public library, it will have the full address, and if there isn't a library in town, the high-school library should be able to supply the information. You're a taxpayer, aren't you?

Paperbacks usually cost a nickel a copy extra from the publisher. The easiest way to find his address is to look in another book by the same publisher on your corner newsstand, or in the drugstore, or wherever they sell paperbacks in your town. If the local distributor doesn't bother with books by that publisher—and we have that problem in Pittsburgh with both books and magazines—try the library again. That's what it's for, isn't it?

Incidentally, it may pay to drive around through the smaller towns in your vicinity. Here in Pennsylvania, outside of Philadelphia at least, small-town newsstands seem to have a much greater selection of both magazines and paperbacks than do the larger cities. Apparently people in small towns still read more for entertainment, but property values are also lower, and a store can afford to set aside space for low-profit magazines and such, where it has to find a more profitable use for the space on city property.

In any case—sorry, folks, but neither Analog nor I is/am in the bookselling business right now. If the magazine changes its policy, John Campbell and the Condé Nast Advertising Department will be the first to tell you. As for me, I have no intention of changing. I *buy* books . . .

THE BEAST
by A. E. van Vogt
Doubleday & Co., Garden City, N.Y.
1963 • 207 pp • $3.50

Twenty years ago, in Astounding Science Fiction for July 1943, November 1943 and April 1944, there appeared a novelette and two "complete novels" by A. E. van Vogt, "The Great Engine," "The Beast," and "The Changeling." From this distance, I can't tell you whether they originally involved the same characters; I suspect they didn't. Now, however, they have been somewhat updated and soldered together into a single typically Van Vogtian yarn of wheels within wheels in cosmic intrigue.

The patchwork shows. In this age of transistors—and the events now take place in 1971—scientists are fiddling with vacuum tubes. The "atomic energy" whose radiations grow a new arm on superman Jim Pendrake is a mystical emanation from the childhood of nuclear physics, bearing very little relation to the work that was then going on in secret laboratories.

There is everything in here but the sink, and the "great engine" of the opening section takes the place of that. Pendrake, one of Van Vogt's now-standard latent supermen, finds it while moping around the outskirts of his estranged wife's estate. He experiments with it, learns something about its power, then loses it to a bunch of highjackers. Involved, before things slow down much, are an organization of would-be supermen, a cabal of East Germans with a secret base on the backside of the Moon, a population of near-immortals *inside* the Moon, dominated by a million-year-old Neanderthaler, a lost lunar race whose machines are still running, and the Government of the United States.

And may I protest, in passing, that there were no Neanderthal men *anywhere* a million years ago, and especially there were none walking down trails in the mountains of the western United States, where no men, Pithecanthropoids or any similar hominids would set foot for a good many hundreds of thousands of years?

THE FOOLS OF TIME
by William E. Barrett
Doubleday & Co., Garden City, N.Y.
1963 • 309 pp • $4.50

Doubleday did not send this book out for review as one of its science-fiction novels. Its author has eight other serious novels to his credit, and might also resent the label. Yet its theme is one that science fiction has explored again and again, shuffling the variations until there is very little new to try—except the approach of "mainline" fiction. If for no other reason, "The Fools of Time" is interesting for the conventions and stereotypes that Mr. Barrett did not use.

This is the immortality story, dated a little way in our future. As it begins, the Russians have announced that they have developed a serum that reverses the aging process. It strips away ten or more years from the recipient's biological age, and holds him there for an unknown length of time. Several of the world's great old figures have gone secretly to Moscow during the five years the serum has been in existence, and have returned rejuvenated. Statesmen of many of the neutral nations are nibbling at the carrot, and so are the old and great of our own allies.

From this point a typical science-fiction novel might follow any of several courses. At the lowest level, there would be a thriller about the American agent who penetrates the Iron Curtain and gives his life to retrieve the secret for Humanity. On a considerably more sophisticated plane, there would be stories about the kind of society which must develop when men and women no longer die. There *have* been many stories—good ones—along those lines.

The typical science-fiction story would be a story about the discovery—about immortality first, and secondarily about the immortal people, and for necessary suspense and melodrama, about the mortals who resent and revolt against the gift. "The Fools of Time," on the other hand, is entirely about people, none of whom, as it happens, has been given the serum.

The book looks over the shoulder of a Denver newspaperman, George Donlin. While the Russian announcement is still news, a strange, erratic medical researcher comes to him with the story that the serum is actually his discovery, a by-product of his discredited cancer research. He was not interested in it, and did nothing to follow it up, but a Mexican assistant took the technique to Moscow. The West can also have immortality—on Dr. David Gerson's terms. Donlin has treated him fairly in the past, when another assistant made wild claims and his cancer research blew up in a fiasco of publicity and accusations; he trusts Donlin to set the record straight this time.

In the rest of the novel, several themes are interwoven. There is the spectacle of Gerson's prickly, utterly intransigent character, utterly intolerant of any view but his own, utterly unable to compromise or accept compromise. There are the fools of Time, the politicians, trying to use Gerson and his serum as a tool in the games of foreign and domestic oneupmanship. There is Donlin himself, standing between Gerson and the world, trying to understand the man, trying to make him understand that people are less simple than biological specimens, unable to spare time for the crises of his own family life. If Gerson is a recognizable type, to be found in almost any laboratory, so is Donlin, the archetype of the man who has so deeply submerged himself in his work that it has become his life.

Conventional science fiction, accommodating itself to the format of magazine and paperback fiction—stories told for entertainment—is forced to use the form of melodrama. Its people are forced out of their ruts and required to cope with situations and forces that strain their capabilities. They are driven by fates and furies, as the ancient Greeks saw their heroes driven by forces outside themselves. The method of "The Fools of Time," on the other hand, is the drama of people being themselves. It is Gerson's fate and his tragedy that he can never yield, never see the gray area between his convictions and those of others. Donlin does what he does, and what he can, because he is a newspaperman and a good editor. The politicians, cynical, calculating, are acting as they have been trained to act, for the reasons they consider most important to them.

The reaction of one of Mr. Barrett's regular readers, who picks up this book, will undoubtedly be "Far-fetched!" Or "Of course, it could never happen." The calloused science-fiction reader, on the other hand, is likely to be bored because of all the obvious complications and permutations the author willfully ignored. Perhaps some in-betweeners will become interested in Dr. David Gerson and George Donlin and what this business of an immortality serum does to them.

CAT'S CRADLE
by Kurt Vonnegut, Jr.
Holt, Rinehart & Winston, New York
1963 • 233 pp $3.95

This, like "Sirens of Titan" before it, is just about unclassifiable. It is less overtly science fiction than that particular jape was; on the other hand, any book that ends with the destruction of the Earth by something called "Ice-9" certainly falls into the SF bin, even if it rattles a little. As was the case with "Sirens," readers are going to either hate the book or revel in it: I've heard of one woman who is giving 'em away by the dozen, hoping to push it into the Best Seller lists and confound everybody.

Satire, needless to say, gallops around like a cat with fits throughout this straight-faced account of the adventures of a hapless journalist who sets out to write a book called "The Day the World Ended," about the activities of various important people on the day Hiroshima was bombed. He wants, among other things, to learn something about one of the lesser-known but more important scientists responsible for the bomb, the late Dr. Felix Hoenikker. This puts him in touch with the altogether remarkable Hoenikker family, the giantess Angela, the midget Newton, and the model-making Frank. He winds up the last President of the Caribbean Republic of San Lorenzo and a convert to Bokononism, the synthetic religion whose philosophy and teachings, imparted to a calypso beat, weave in and out of the page-long chapters, making sense out of the farthest-out nonsense.

Looking at the string-figure his father had made, little Newt Hoenikker said: "No cat, no cradle." The *Books of Bokonon* instruct Bokonon's disciples to live by the harmless untruths that make them brave and kind and healthy and happy. "Pay no attention to Caesar," the Book says; "Caesar has no idea what's *really* going on."

As with Caesar, so with the hapless reader of "Cat's Cradle." Unless, of course, he's as sharp as Bokonon.

LORDS OF THE PSYCHON

by Daniel F. Galouye

Bantam Books, New York

No. J2555 • 1963 • 153 pp • 40¢

Any writer would be hard-put to equal the *tour de force* of "Dark Universe," and Daniel Galouye hasn't quite made it in his second book. For all that, he has created a world just as memorable in its color and brilliance as the lightless world of the earlier book.

In 1993 the remnants of humanity are refugees on their own planet, dominated by the shining cities of the Spheres. For seventeen years, the glowing globes have issued from these fiery structures to track down and kill those they have "selected." For seventeen years, a remnant of the U.S. Armed Forces has clung to the hope of somehow destroying the things that destroyed human civilization. And for seventeen years, every September 25th, a grid of yellow-green fire has spread across the heavens and generated the mental and physical torment of Horror Day.

Captain Jeff Maddux, USA, is the leader of the patched-together military force that is making the last stand against the Spheres. His post, on the outskirts of one of the cities that was destroyed by the onslaught from space in 1977, is ringed by the crumbling villages of people who hate him and the Spheres equally. Civilization has been forced back more than a century, for any flow of electricity brings instead punishment from creatures that can pass through matter and drink energy from the Sun. And there is a cult that all but worships the things.

Then chance gives Maddux a beginning of insight into the nature of the forces that govern the Spheres and their cities. A stranger brings two rings of force from one of the Cities—and Maddux learns how to generate and destroy the pink stuff a drunken biochemist dubs "psychon," the mentally controlled basic stuff from which matter, energy—the universe itself—is made. In a "fight fire with fire" program, they struggle to gain enough control of the stuff to strike back on the final Horror Day, when Earth is to be drawn through a rift in space-time into the continuum of the Spheres.

There has been nothing like the Cities of Force or the Spheres since A. Merritt's "Mental Emperor," and it is a mark of forty years increasing sophistication of fiction that Galouye's Spheres are real in a way that Merritt's never were, and that Maddux and his little group fight back with will and intelligence whereas the people of "The Metal Emperor" had only one goal—a rabbit's—to escape.

CAPTIVES OF THE FLAME

by Samuel R. Delaney

THE PSIONIC MENACE

by Keith Woodcott

Ace Books, New York

No. F-199 • 1963

167+108 pp • 40¢

Like a few other writers, Samuel Delaney is restoring some stature to the old-fashioned SF romance of the days of A. Merritt, Ray Cummings, and the early Edmund Hamilton. This is the first of a trilogy laid in the same far-future world that we encountered in his earlier Ace book, "The Jewels of Aptor." *If it hasn't quite the impact* of that story, it may be because the author is holding back a little too much, saving some of his punches for the other two books.

This is Earth centuries and probably millennia after an atomic holocaust, maybe the next one, maybe the *real* Last War. The very geography of the planet has been changed, and zones of radiation have cut the still habitable portions up into isolated pockets where evolution and mutation have taken strange paths. Aptor was in one of these pockets; the Empire of Toromon, of this story or series, is in another. The island capital draws on the surrounding seas and forested mainland for its food, and employs slave labor to mine the element that powers its few machines. To sustain this shaky economy, the powers behind the throne have decreed war against an unseen, unknown enemy beyond the radiation barrier whose advance had swallowed up their frontier city of Telphar. But an underground of strangely mixed allies has other ideas.

Nuclear physics, these days, is much concerned with the strangeness of the elementary particles. These tales of Samuel Delany's have a fine, rich strangeness that some people just don't like. But if you do, here is some of the best that's being done in these matter-of-fact days.

On the flip side, an English author handles a similarly way-out adventure yarn smoothly. It's fun, but you won't remember it as you will Delany's. The scene is also an old, changed, shriveled Earth. Out among the stars the sterile, inbred Starfolk rule a circle of worlds with bitter cruelty; they have made *themselves into a separate race,* superior—as they see it—to all others. On the Starfolk worlds and on Earth's smaller circle of dependencies are colonies of telepaths, feared, hated and isolated, and viciously persecuted by the Starfolk. And now, out of the depths of space, comes a telepathic screaming that promises the end of the Universe. Somehow the key to the anguished wail seems to be on Regnier's Planet, among the unexplored ruins of the mysterious Old Race that once spread through the stars. So Philip Gascon, archeologist, is sent to find out what he can and stave off the end of the Universe if that is possible.

Gascon's problem grows very complex before he is done, needless to say. As Harry Golden would say, "Enjoy, enjoy!" And if you can, believe a little.

JOURNEY BEYOND TOMORROW

by Robert Sheckley
Signet Books, N.Y.
No. D-2223 • 1963 • 144 pp. 50¢

This collection of traditions and legends about events in our time, set down by Polynesian scholars and folklorists a thousand years from now, was serialized in *Fantasy & Science Fiction* as "Journey of Joenes." It records the supposed adventures of a naive young man from the South Seas among the perils of 21st Century American civilization. Using the thousand-year gap to lard Joenes' adventures liberally with anachronisms, the episodic chronicle rudely lampoons most of the more vulnerable aspects of our society.

Innocently—of course—involved with some friendly San Francisco beatniks, Joenes is promptly arrested as a Communist and hauled before a Congressional investigating committee, convicted out of hand and sentenced by the Sperry Oracle. He is paroled, listens sympathetically to the stories and parables of assorted citizens of all times, finds refuge in an insane asylum, joins the faculty of a university, visits an academic utopia in the Adirondacks, is sought out by the government, wanders through the Octagon, is sent as a spy to Russia, is entrapped in the Last War, eventually makes his way back to the South Pacific.

All this is amusing, but it fails to come off. Never for one moment is Joenes believable as the kind of folk hero the Polynesians would remember for a thousand years—although they are a people who used to remember family trees that long. To be unfair about it, the wanderings of Joenes lack the kind of unity that the wanderings of Odysseus have—and the extra centuries should have smoothed out and standardized the legends, rather than made them more lumpy.

It was doubtless amusing to write, and it is amusing to read, but not very much more.

REPRINTS AND RE RE-PRINTS

WALDO and MAGIC, INC.

by Robert A. Heinlein
Pyramid Books, New York
No. F-859 • 1963 • 191 pp • 40¢

Another re-print or reissue of the paperback edition of two short and excellent Heinlein novels: "Waldo" about the fat genius in orbit, "Magic Inc." about a present like our own except that magic works. They were here in Astounding in the 1940s and haven't aged a bit.

THE CURRENTS OF SPACE

by Isaac Asimov
Lancer Books, New York
No. 74-816 • 1963 • 191 pp • 75¢

THE END OF ETERNITY

by Isaac Asimov
Lancer Books, New York
No. 74-818 • 1963 • 176 pp • 75¢

Two more Asimov classics in, fittingly enough, the Lancer Science Fiction Classics Library.

PLANET OF PERIL

by Otis Adelbert Kline
Ace Books, New York
No. F-211 • 1963 • 160 pp • 40¢

An Ace reprint of the Avalon hardback edition of Kline's first Venus book. An open imitation of Burroughs, though on a different planet, the exploits of Robert Grandon were later imitated by Burroughs' own Venus series, which are on Ace's schedule also.

THE LAND THAT TIME FORGOT and THE MOON MAID

by Edgar Rice Burroughs
Dover Publications, New York
No. T-358 • 1963 • 552 pp
$2.00 paper; $3.75 cloth

An omnibus volume with two of Burroughs' best and most characteristic books, both reprinted by Canaveral last year in new hardback editions. Dover gives you five of the original St. John illustrations in facsimile. Both books originally appeared in magazines as a series of novelettes, and Ace is bringing out *its* paperback editions in this original form. We've noted the two parts of "The Moon Maid" previously; now the first two of three parts of "The Land That Time Forgot" are out, as follows:

THE LAND THAT TIME FORGOT

by Edgar Rice Burroughs
Ace Books, New York
No. F-213 • 1963 • 126 pp. • 40¢

THE PEOPLE THAT TIME FORGOT

by Edgar Rice Burroughs
Ace Books, New York
No. F-220 • 1963 • 124 pp • 40¢

These have spirited new covers and title-page decorations by Roy Krenkel, Jr., the new artist who seems to come closer to the St. John style than anyone. The third part, "Out of Time's Abyss," will doubtless be along before you see this. Dover has all three parts together, as had the original book.

THE BEST FROM FANTASY AND SCIENCE FICTION, 8th SERIES,

edited by Anthony Boucher
Ace Books, New York
No. F-217 • 1963 • 224 pp • 40¢

These reprinted annuals are all bargains.

THE MAN WHO UPSET THE UNIVERSE

by Isaac Asimov
Ace Books, New York
No. F-216 • 254 pp • 40¢

A reissue. This is Ace's title for "Foundation and Empire," the second of the "Foundation" books.

BRASS TACKS

Continued from page 5

couldn't be maintained by the anti-organizational Greeks. (They never organized anything much beyond a city-state, in complete contrast to the less imaginative but better integrated Romans.)

Negro Africa had several very-temporary empires—Prester John's was one—but could not maintain any.

Dear Sir:

Your June editorial on language as a product of the mind led me off onto many little pleasant thought-tangents that I would like to share with someone—but, being a scientist-type misplaced in the engineering field (most engineers are illiterate bores), I have no acquaintances who even read Analog, let alone who would enjoy discussing your editorials.

So, I'll bore you with just one of my little ideas just to get it out of my system. I'll confess, I'm not an English professor—just one of the grubby peasants who got his language the hard way—but here's my idea, anyway.

You mentioned two "present" verb forms and then derived a simple but subtle rule for their use—a rule which differentiates between *objectively observable* and *subjective* action.

Fine—as far as you go!

Now try this: your objectively observable action, the so-called "present progressive," is the only truly "present" tense of the verb. The other—the "I think," "I see," "I larb"—is subjective, yes, but also *non-time-connected!* It is neither past, present, nor future. It is a purely subjective, human nervous system expression of *existence* which is not related to time—just as human memory (whether sensory or conceptual) is not time-related (except as a sophisticated, learned, cross-indexing supplementary system).

Sure, all adults remember by time-sequence. But just ask a very young child who hasn't yet learned to "label" his memories by time-sequence what he did "yesterday." You could get any event that ever happened to him!

Consider also—the very basic pain-conditioned reflex which all animate life uses as a survival mechanism. Once there, it is there. It is no more time-connected than your arm. It just works! So, the human nervous system *as it evolved* had little use for the fancy time-sense we now employ in our modern languages. But it does recognize, create, and persistently use a non-time verb form—"I am," "I see," "I think," "I understand," "I live," "I die."

The thought once thought, the sight once seen, is *there* in the mind—only molecules away from the thoughts and sights of forty years ago—with the time-label a Johnny-come-lately sophistication.

All very subjective and elemental, and neither past, present, nor future. Seems I remember reading about a whole Amerind language like this. One that treats all time as "now" and has no tenses.

At any rate—thanks for an enjoyable few minutes.

F. A. Barnes

P. O. Box 483
Sunnyvale, California

Thanks for the very valid comments . . . except for "I die". No organism ever evolved with that experience!

Dear Mr. Campbell:

Although I have counted you among my personal intellectual bodhisattavas for a great many years now, I—and other Houston Esperantists—would like to take strong issue with certain portions of your editorial, "The International Language," which appeared in the June issue.

I do not share your optimism regarding the future of the English language as the "international language," and particularly regarding its supposed present status as such. The fallacies of this concept were pointed out in an article, "The Decline of English as 'World Language,'" in the May issue of the *NordAmerika Esperanto-Revuo.*

Also, I would like to point out certain factual errors regarding Esperanto. These, I'm sure, were merely from lack of information. (Or so I told the lynch mob which formed shortly after our Esperanto club meeting where your editorial was read.)

First, I'd like to straighten one thing out: Although I am not an expert on Interlingua, I remember glancing through an Interlingua grammar, and noting that Interlingua was nearer the grammatical structure of the romance languages than Esperanto, and hence more complicated and less compact. The Interlingua verb has three infinitive forms, and Esperanto has only one. The Interlingua verb has a different verb termination for each pronoun in each tense; in Esperanto, there is only one termination for each tense, regardless of modifying pronoun. The basic-basic grammar of Esperanto has only sixteen fundamental, completely regular rules; they can be printed on the back of a postcard.

Again, you bracket Esperanto and Interlingua together, and state ". . . nobody *talks* either one." In regard to Esperanto, nothing could be more false: Esperanto is spoken all over the world, whenever and wherever Esperantists gather.

There are regular and frequent broadcasts in Esperanto over European short-wave stations.

Every year there is an international Universal Esperanto-Congress where Esperantists from all over the world gather, and where Esperanto is the sole language of communication. (These international gatherings are sponsored by the world Esperanto movement, the Universala Esperanto-Asocio, whose headquarters are in Rotterdam, Nederlands.) The national Esperanto federations throughout the world hold their own yearly conventions, at which Esperanto is spoken. Local Esperanto clubs meet as frequently as possible for the primary purpose of speaking Esperanto.

Also, there exist organizations—ranging through international chess federations, through Buddhist, Protestant, and Roman Catholic associations, to nudists—who use Esperanto: Not only as the official language of their internationally circulated periodicals, but in their international conferences.

And, finally from my own experience, I am courting a girl, whom I hope eventually to marry, solely in Esperanto. Her English is very limited, and I can speak no Japanese. We are not unique, either. There are many others like us throughout the Esperanto world.

As for Esperanto not being international, that's absurd on the face of it. Esperanto has had a steady growth since Dr. L. L. Zamenhof published the first textbook in the summer of 1887. This growth has accelerated since the end of World War II. From a mere project formulated by a Jewish physician/linguist, it has evolved into a living language. The descriptive adjective, "living," is what makes Esperanto different from Interlingua, Ido, and the rest. Esperanto is both living and international, because it has indeed succeeded in ". . . getting people interested." Esperanto exists as an international social phenomenon from the Canadian arctic to the interior of China.

Esperanto has grown far beyond a mere ". . . intellectual hobby . . ." It is a living language, already possessing a literature and a tradition, and the beginnings of a planet-wide culture.

Although the Esperanto movement is not as strong in America as it is in Europe and Japan, most major American cities now have Esperanto clubs. New York, for example, has three.

Edward F. Lacy III,
Acting President,
Esperanto Club of Houston.
6923 Schley St.
Houston 17, Texas.

Hm-m-m—but Latin is the international language of a much older and wide-spread organization. And Latin is not usually considered a living language.

Dear Mr. Campbell:

You might be interested to know that your editorial in the June issue of Analog is in line with some of the more recent work in English grammar. Grammatical rules, as they have filtered down into the college and school textbooks, are mostly the result of efforts of a few classical scholars in the last century, who tried to impose the rules of Latin grammar on English. It is not hard to find simple English sentences which stretch or break these rules, as you pointed out. Language is constantly changing, and it is hard for the rule-makers to keep up.

The infinitive of the verb in "What hath God wrought!" is "to work," theoretically. "Wrought" is an alternate form of "worked," which has been kept in the language because it has developed a meaning sufficiently different from "worked" to make it useful. In fact, it is no longer associated with the word "work" in the minds of anyone but theorists, so that in practice it has become a verb with no present or future tenses.

There *are* rules which explain almost all the idiosyncrasies of English, but unfortunately they are necessarily so complicated that they would probably only make it harder for anyone to learn English. Grammar based on what the language *ought* to be is simple enough, but doesn't work very well; grammar which is based on what the language *is* is almost more complicated than the language! Unless, of course, the man who is trying to learn English already is familiar with Anglo-Saxon, Old Norse, Latin, and the French of Normandy in the Eleventh Century—then all he needs to do is to learn how everything which has gone into English in the last dozen or two centuries has changed into something he can barely recognize.

In fact, it is intuition and familiarity which must supplement the English grammar which a foreigner learns, if he ever wants to speak good English. That is why the most complicated computers so far used on language translation, designed by some of the most intelligent people in the country, cannot translate another language into English as idiomatically as the average immigrant, who will develop enough English in a few years to suit whatever environment he finds himself.

It is just as well that people would rather learn English than Esperanto. Any artificial language designed by a limited number of people will be limited, restrictive, and affected by the unconscious biases of the inventors. And since language affects thinking, it is obvious that if everyone in the world ever speaks and knows only one language, it is going to have to be a real, complicated, illogical and organic language, like English.

Anthony Low
55 Eustis Street,
Cambridge 40, Massachusetts.

One of the reasons why the One World idea wouldn't work out so good is that same factor. We need the variations that are inevitable in multiplicity!

Dear Mr. Campbell:

The logical language fails for the same reason that the finest Robot, fully instrumented and completely duplicating a Human, would fail completely.

It would not have a spark of life—why is an artificial language dead? Just as the Robot, it contains none of the quirks and irrationalities that people themselves have and that their language has developed.

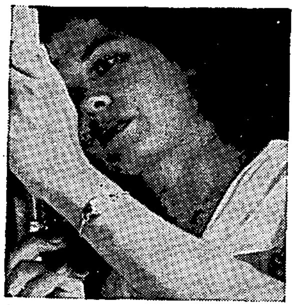
Language mirrors ourselves, or rather our minds, rational and irrational—science, technology, mathematics, et cetera, looks for logic, order, pattern, laws, rules, i.e. 2+2 equals 4, if it equals 5, it's crazy; but, a Human Being will add 2 plus 2 to equal 5; not a computer or an artificial language.

I started out as an engineer—have a physics degree—but, now, I'm in the marketing end, why? Engineering deals with machines, there is no warmth to it, perhaps it's too logical. You build an electronic device and expect it to do something in a predictable way, day after day, if it doesn't, there's something wrong with it.

People, however, do the unexpected. The Poll-Takers predict an election outcome, based upon a careful scientific survey, the people say: Yes, that is the man who should be elected, then, they go to the polls—and elect a completely illogical candidate!

Continued

Farmer



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BRASS TACKS

Our Language is the transmitter and receiver of the Human Race, it may have a lot of static, but, that's what makes it interesting.

Some years ago, a communications device was in quite common use, and, it was and is, an artificial language. What could be simpler than the Morse code of the telegraph? Dots and dashes, and yet, each telegrapher developed a recognizable "fist," in spite of the cold logic of dot-dash.

This is the human tendency, to put warmth, life, into our language—indeed, who would find the reading of an insurance company's actuary, tables enjoyable, but, glance at a page of Webster's Unabridged dictionary, and you will soon find yourself *reading* it!

Julius A. Duda,
23 Andover Lane,
Strathmore at Matawan,
New Jersey

Some are dictionary readers—sadly, judging by current mass media, the overwhelming majority definitely are not!

Dear Mr. Campbell:

Your interesting reappraisal of the nature of planetary atmospheres in the July issue of Analog seemed over-pessimistic in its implications about livable planets. And at the same time the most pessimistic implication of all was not discussed.

First of all, the revelation that the reddish color of Mars is due to the presence of NO_2 in its atmosphere did not strike me as adding much to Mars' inhospitability as we already knew it. As a chemist, I have often worked in labs where the NO_2 content was so high that if the Martian atmosphere had a similar concentration it would be completely opaque! I, therefore, doubt that the effects of the NO_2 on men and machines which might land on Mars would be worth worrying about. However, as you point out, the presence of NO_2 on Mars implies that there are no life forms there to consume it and rid the atmosphere of it, as on Earth. Indeed, all that might be required to make Mars more "Earth-like" is for us to seed the planet with the proper NO_2-consuming biological organism, if we can find a way around the minor little problem of Mars' absence of water.

But, if all that is required to give Mars an atmosphere with "inert" nitrogen like that of Earth is a living organism, then your argument about Earth being untypical as planets go is slightly undermined. For if Mars had been just a little larger than it is—large enough to hold on to enough hydrogen to form a shallow sea of water—it would then be capable of supporting life as we know it and having an "untypical" atmosphere. What a remarkable coincidence it would then be to have two untypical planets together in the same solar system.

To further argue that Earth is not untypical, and to bring forth the most pessimistic implication of all to be drawn from the findings about the atmosphere of Venus, I think that in your statement: "Earth's atmosphere should be at least two whole orders of magnitude greater than it is," the word "should" ought to be amended to "could" or even "will." Two things need to be pointed out: 1) our oceans contain an awful lot of water; and 2) Ernst Opik and other astronomers believe that the sun is gradually increasing in radiation output as the hydrogen in the core is used up.

Now, the sun's radiation should not burn us to a crisp for another billion years, according to Opik, but I hereby submit that the greenhouse effect which has taken place on Venus may also occur on Earth, and much sooner than a billion years; perhaps, conceivably, as soon as we're out of the present series of ice ages, in other words, in a few tens of thousands of years. Fantastic? Yes, when we think of the temperature-stabilizing forces which the oceans now provide us. An increase in radiation from the sun causes more evaporation, leading to increased cloud cover, which in turn decreases the *effective* radiation received, by reflecting the sun's light back into space. When radiation decreases, so does evaporation, leading to less cloud cover and more solar radiation warming the surface. A very nice servo-mechanistic temperature regulator. But when Earth's cloud cover, at some future time, comes to be on the average close to 100%, what happens then? At that point increases in the sun's radiation will no longer be offset by changes in Earth's albedo. More evaporation will mean still more clouds, but this will have to express itself as "taller clouds" rather than as larger area of cloud cover—you can't exceed 100%. Taller clouds, while not providing more reflecting power, should make a better greenhouse, leading to more evaporation, leading to even taller clouds, leading to an even better greenhouse, leading to—?

LAUREN B. DOYLE

The trouble with self-regulating systems is that when their limit of automatic adjustment is reached, the system goes wild suddenly, completely and dramatically!

Dear Sir:

I was interested in the statement of John D. Clark in Brass Tacks for June. He asked, in part, "How do you run a society in which the only NEEDED people are PHDs, computer programmers or top-flight artists?" He finished by suggesting that Analog writers investigate this problem.

Someone ought to tell Mr. Clark that this job has already been done in considerable depth and detail way back in the early 1930s. During those early depression years the Technical Alliance, an organization whose roster included such names as Carl Steinmetz, Thorstein Veblen, Bassett Jones, Richard Tolman, Frederick J. Ackerman, Stuart Chase, King Hubbart and Howard Scott were grappling with just such a problem. Using unemployed architects and draftsmen supplied by the New York state relief organization and working at Columbia University using office space supplied by Columbia's Dr. Walter Rautenstrauch these men were investigating the problems of producing a high standard of living and the problem of

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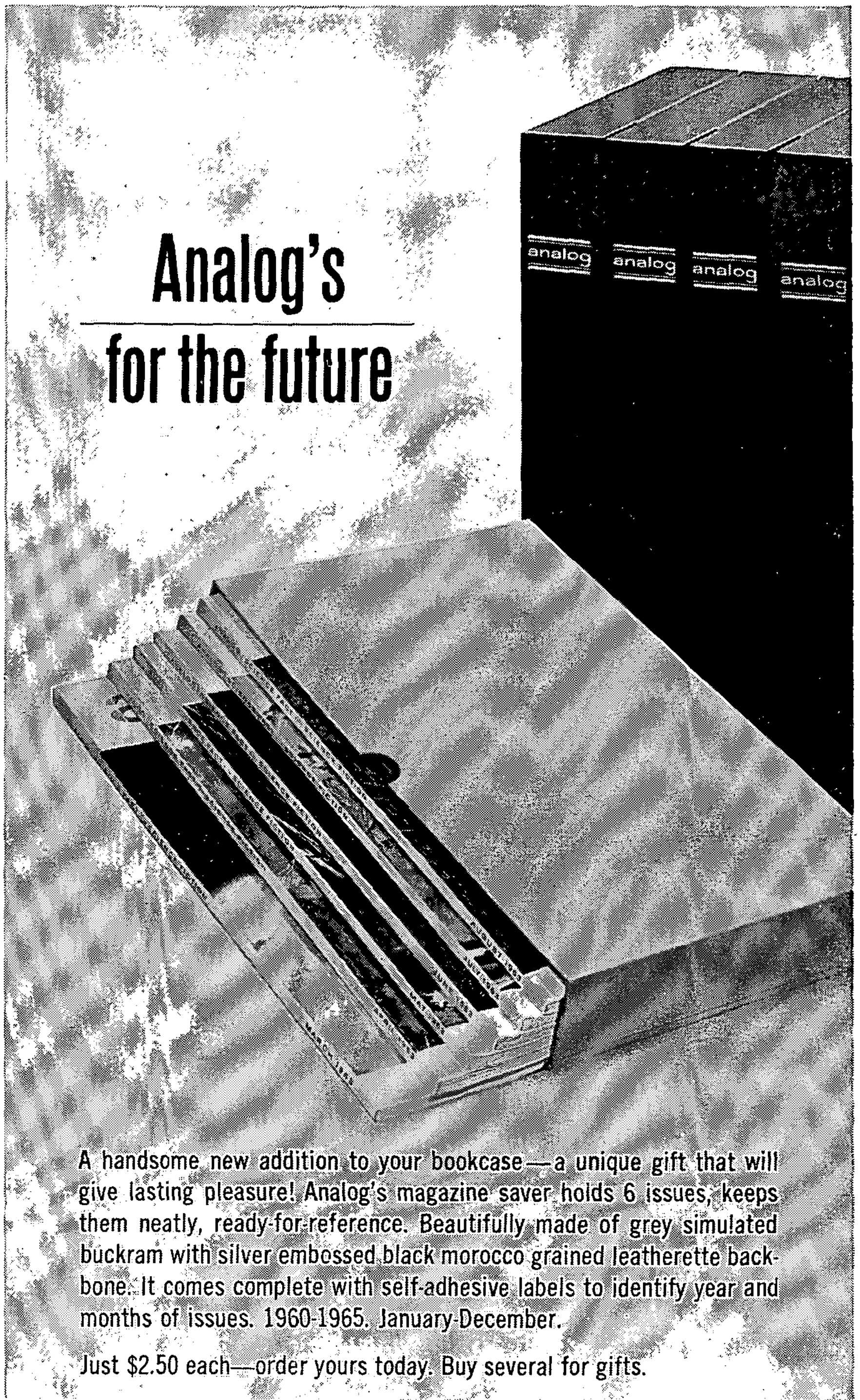

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BRASS TACKS

distributing the fruits of this high standard of living to the people.

Question: How do you distribute an abundance of goods and services when a large percentage of your people are unemployed?

Question: What can be an effective substitute for the money which these people can't earn?

Question: How do you co-ordinate nation wide production and distribution so that the equation comes out even at the end of the production-distribution cycle?

Question: How do you maintain a high plateau of prosperity without significant fluctuation indefinitely and without seriously depleting your mineral and fuel reserves?

The answers to these and many other questions were formulated during this research. The label under which this system of social control was finally presented to the public was, of course, Technocracy. The public rejected it, mainly I suspect, because it was fairly obvious that only a dictatorial control of every facet of production and distribution could make the scheme work. During World War II we found that if you attempted to control prices by government edict then this effort would in turn demand that you also control the sources of supply. One control inevitably leads to the next.

The Technocrats never admitted that the Technate, the proposed Technological State would involve a dictatorship. Rather, they insisted, the scientific facts would dictate the orders which would be given by the small elite group of administrating Engineers and Technicians.

The distinction was a little too subtile for the average American. Technocracy lasted for a long time as a flourishing organization but the war removed any pressing necessity for drastic social change.

And now here we are again—again on the verge of another situation in which a socially significant section of the American people will soon be unemployable. The reasons will be different but the results will be the same. Now let us see if the leaders of our country can develop a better answer to this thirty-year old problem. Can they develop a different answer?

Mr. Clark is right, you know. This problem is very real and very serious. It is only a little way ahead in our future. It could be much more serious than our struggle with Red Russia and Red China. When you are at war—at least you eat regularly.

N. K. Johnson

1747½ N. Gardner,
Los Angeles 46, California

Maybe we can combine the two problems and have a computing machine dictator. The machine would be certain to be honest, sincere, logical, accurate, not given to graft, sin, nepotism—or mercy. It would be perfectly truthful—and perfectly ruthless.

It would, for the first time in history, be truly a "government of Laws, not of Men."

Dear Mr. Campbell:

In your editorial on the International Language in the June issue, you neglected to mention the great (?) contribution of the Americans to the English language—intonation to give meaning.

To give you a forinstance, I am listing ten possible answers to the question "Do you have a dog?", using the great American habit of answering a question by repeating the question, changing the pronoun and intoning the whole thing. (I have underlined the accented words and added an explanatory phrase in parentheses, so that you may more easily figure out the intonation involved.)

1. *Do* I have a dog? (I didn't quite hear you.)
2. Do *I* have a dog? (I'm a dog lover. I have three.)
3. Do *I* have a dog? (I prefer cats.)
4. Do *I* have a *dog*—(Let me tell you about my smart dog.)
5. Do *I* have a *dog?* (I loathe dogs.)
6. Do *I have* a dog? (My dog owns me.)
7. Do I *Have* a dog? (I did. He died.)
8. Do I have *a* dog? (I have six.)
9. Do I have a *dog*—(He's a champion.)
10. Do I have a *dog!* (I'll never buy a car like that again.)

That is all that comes to mind right now. I'm sure you could find a few more if you tried. Fun, Isn't it?

Betsy R. Freitag

61 Inwood Street,
Cheverly, Maryland

O.K.—now run that through a computer translator!

Dear Mr. Campbell:

At a meeting last night there was some buzz about Gordon Cooper's 22 loop circuit of the globe.

One of the boys figured that since Cooper had made 22 orbits and seen 23 sunrises in 1½ days elapsed time from our earthbound point-of-view, Cooper must have come down around 21 days older than the rest of us.

Another one said that this was not true, because elapsed time was all that counted, and since he was gone only 1½ days he was, therefore, no older than the rest of us.

So, a third one spoke up and said that both of the others were wrong, becuz, "We learned from Einstein that at the speed of light, time stands still, therefore, since Cooper was traveling much faster than any of us, time was going slower for him, therefore he aged less than we did during those 1½ days, coming back less old than he would have been had he stayed on the terra firma".

O.K., so who's got the right idea? With a choice like this, which one would you buy? Maybe you have still a better idea?

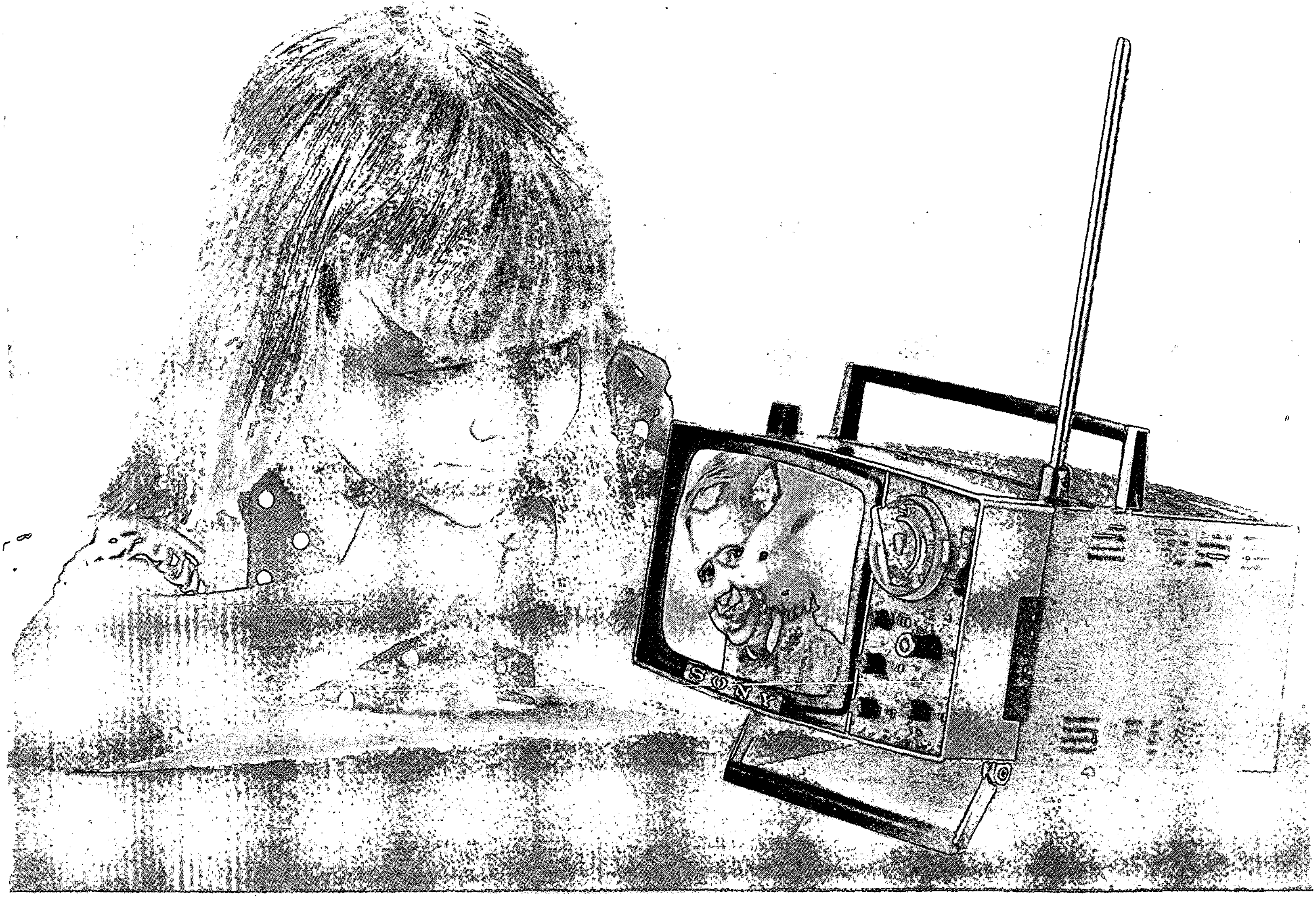
We are really in orbit over this and are hoping that you can push the right button for a successful splashdown. Thanks.

Leo Reising

Box 3333, Station D,
Albuquerque, New Mexico

I don't know whether or not he was older or younger—but I'll bet he FELT older, after that instrument system in the capsule quit on him!

Alice in SONY land



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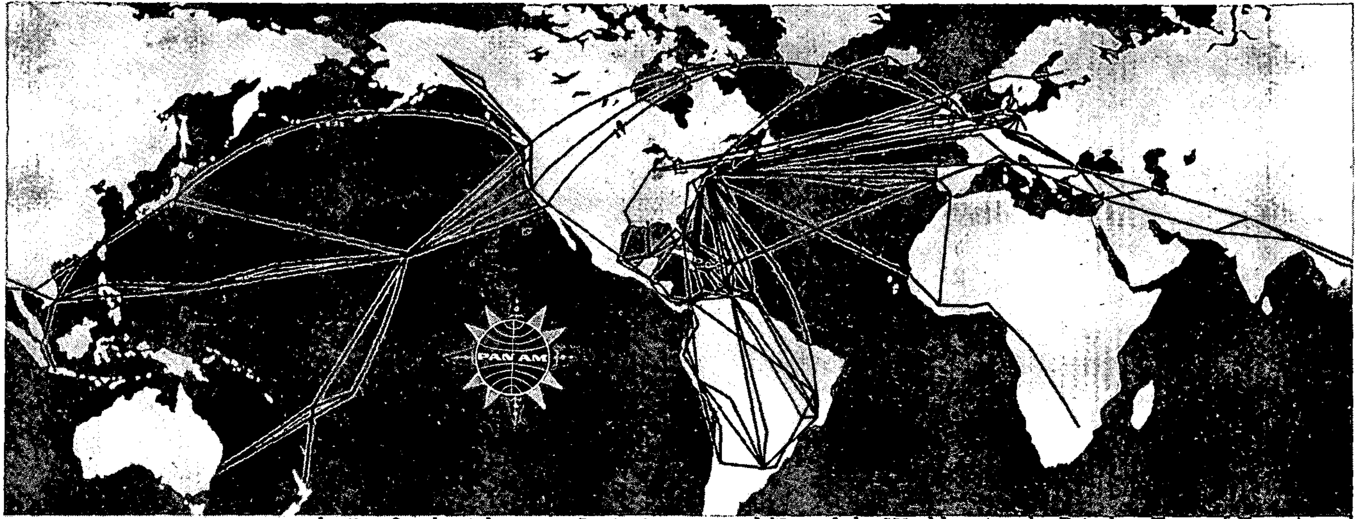

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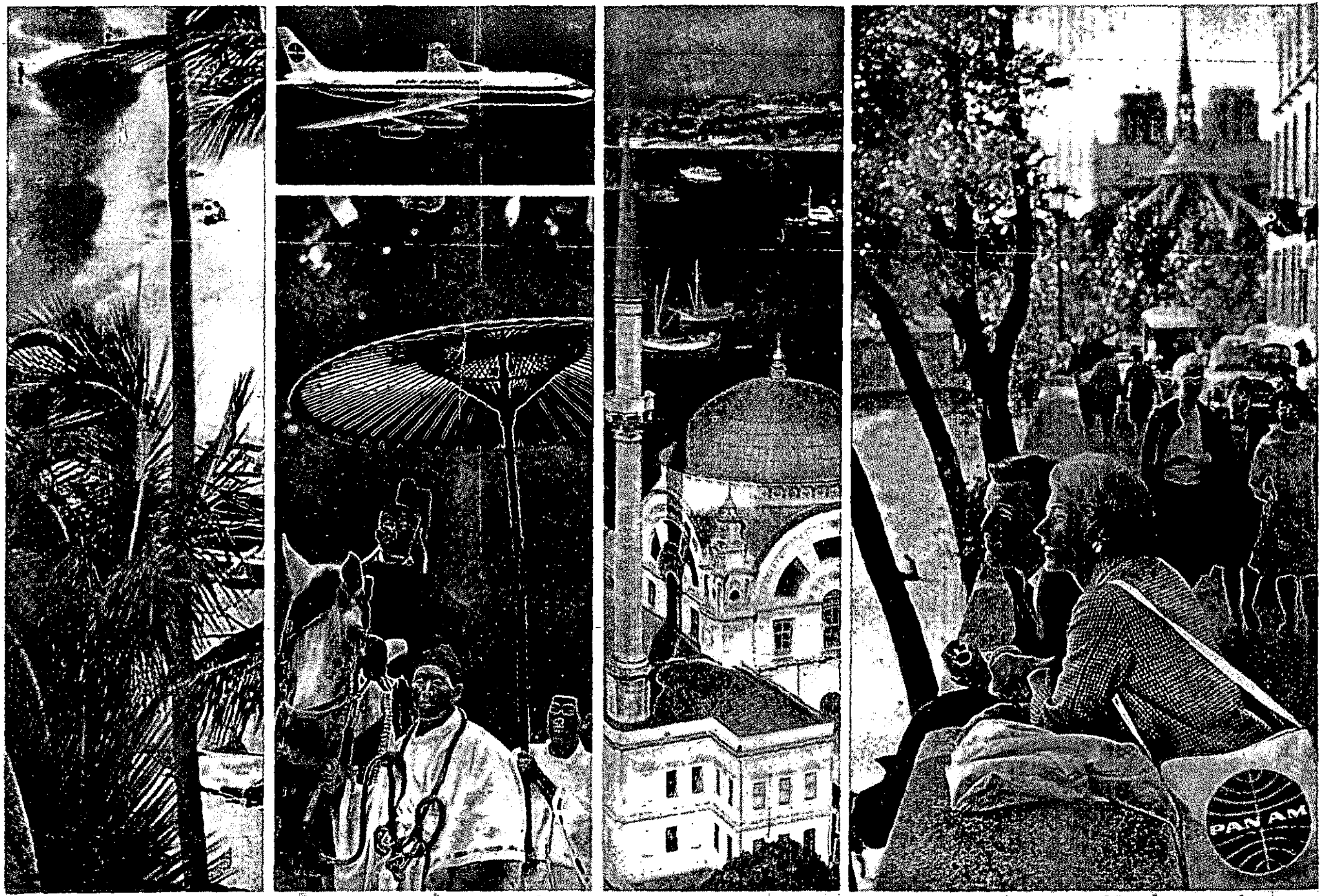

Honolulu, Tokyo, Istanbul, Paris—typical ports-of-call for 50,000 'Round the World passengers last year